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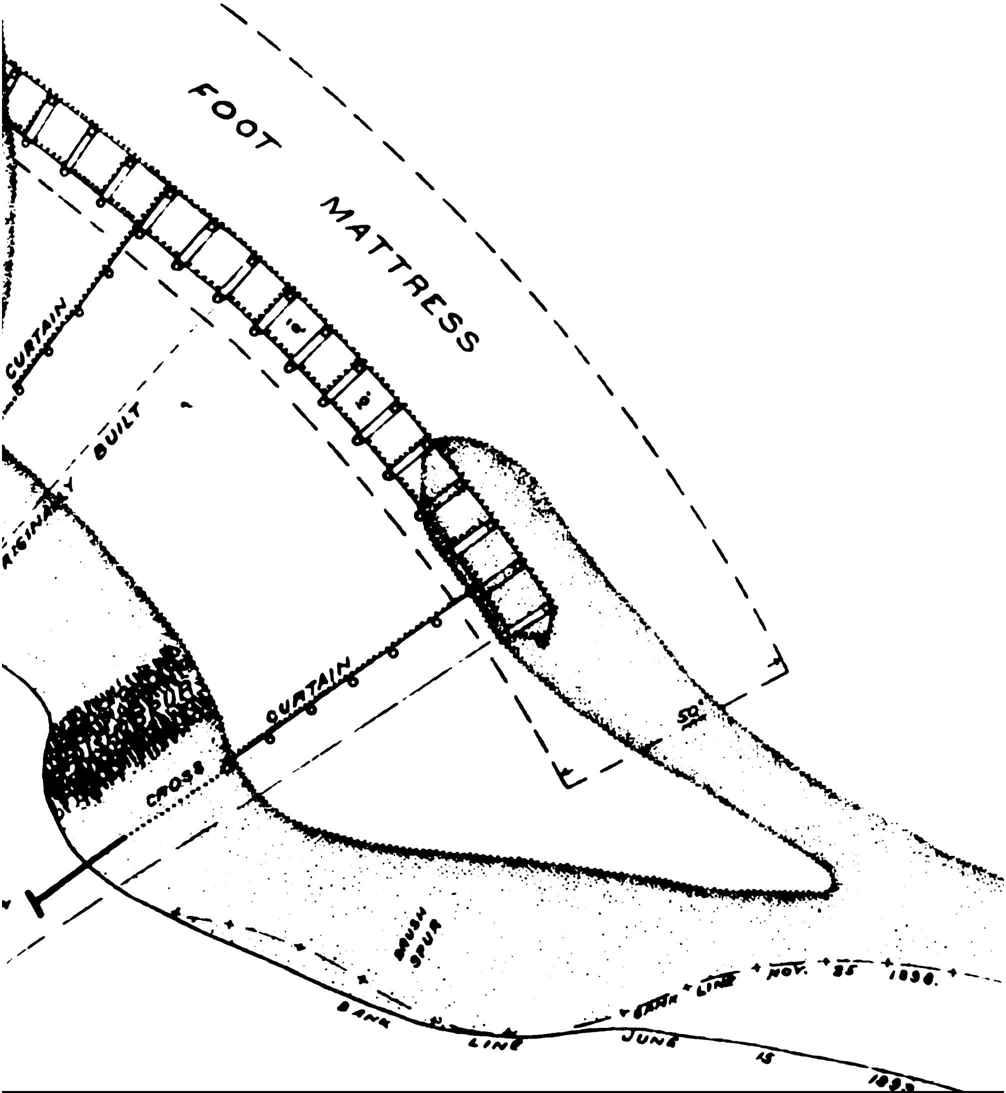

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WAR DEPARTMENT

FOR THE

FISCAL YEAR ENDED JUNE 30, 1899.

REPORT OF THE
CHIEF OF ENGINEERS.
PART 6.

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VOLUME II. **Parts 1–6.—Report of the Chief of Engineers.**

VOLUME III. **Report of the Chief of Ordnance.**

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APPENDIX H.

REPORT OF LIEUT. COL. C. W. RAYMOND, CORPS OF ENGINEERS.

IMPROVEMENTS.—Delaware River, N. J. and Pa., 1317; harbor between Philadelphia, Pa., and Camden, N. J., 1328; Schuylkill River, Pa., 1339; ice harbor at Marcushook, Pa., iron pier in Delaware Bay, near Lewes, Del., 1344; Delaware Breakwater, Del., 1345; harbor of refuge, Delaware Bay, Del., 1354; Rancocas River, N. J., 1356; Alloway Creek, N. J., 1358; Cooper Creek, N. J., 1360; Goshen Creek, N. J., 1362; Mantua Creek, N. J., 1364; removing sunken vessels or craft obstructing or endangering navigation, 1367.

APPENDIX I.

REPORT OF WM. F. SMITH, UNITED STATES AGENT, MAJOR OF ENGINEERS, UNITED STATES ARMY, RETIRED.

IMPROVEMENTS.—Wilmington Harbor, Del., 1369; Appoquinimink River, Del., 1374; Smyrna River, Del., 1376; Murderkill River, Del., 1378; Mispillion River, Del., 1379; Broadkiln River, Del., 1380; inland waterway from Chincoteague Bay, Va., to Delaware Bay, at or near Lewes, Del., 1381; Susquehanna River, above and below Havre de Grace, Md., 1382; Chester River, Md., from Crumpton to Jones Landing, 1383; Choptank River, Md., 1384; La Trappe River, Md., 1386; Warwick River, Md., 1387; Broad Creek River, Del., 1389; Nanticoke River, Del. and Md., 1391; Wicomico River, Md., 1392; Manokin River, Md., 1394; Pocomoke River, Md., below Snow Hill, 1395; Queenstown Harbor, Md., Rockhall Harbor and inner harbor, at Rockhall, Md., 1397; removing sunken vessels or craft obstructing or endangering navigation, 1398.

HARBOR LINES.—Annemessex River, at Crisfield, Md., 1399.

APPENDIX J.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS.

IMPROVEMENTS.—Patapsco River and channel to Baltimore, Md., 1405; channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Md., 1409; harbor of southwest Baltimore (Spring Garden), Md., removing sunken vessels or craft obstructing or endangering navigation, 1410.

HARBOR LINES.—Patapsco River, at Sparrows Point, Md., 1410.

APPENDIX K.

REPORT OF LIEUT. COL. CHAS. J. ALLEN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Potomac River at Washington, D. C., 1413; Potomac River below Washington, D. C., 1419; Occoquan Creek, Va., 1421; Aquia Creek, Va., Nomini Creek, Va., 1423; Lower Machodoc Creek, Va., 1424; Rappahannock River, Va., 1425; Urbana Creek, Va., 1428; harbor at Milford Haven, Va., 1429; York River, Va., 1431; Mattaponi River, Va., 1433; Pamunkey River, Va., 1435; James River, Va., 1436; protection of Jamestown Island, Va., 1440; removing sunken vessels or craft obstructing or endangering navigation, 1442.

SURVEY.—Anacostia River, D. C., 1443.

HARBOR LINES.—Potomac River at Washington, D. C., 1463.

APPENDIX L.

REPORT OF MAJ. THOS. L. CASEY, CORPS OF ENGINEERS.

IMPROVEMENTS.—Harbor at Norfolk and its approaches, Va., 1471; Elizabeth River, Va., 1473; Western Branch of Elizabeth River, Va., 1474; Nansemond River, Va., 1475; Appomattox River, Va., 1476; harbor at Cape Charles City, Va., 1478; Nandua Creek, Va., 1479; inland water route from Norfolk, Va., to the sounds of North Carolina, 1480; inland water route from Norfolk, Va., to Albemarle Sound, N. C., through Currituck Sound, 1481; Edenton Bay, N. C., 1482; Roanoke River, N. C., 1483; Pasquotank River, N. C., removing sunken vessels or craft obstructing or endangering navigation, 1484.

SURVEY.—Deep Creek Branch, Elizabeth River, Va., 1485.

APPENDIX M.

REPORT OF CAPT. E. W. VAN C. LUCAS, CORPS OF ENGINEERS.

IMPROVEMENTS.—Ocracoke Inlet, N. C., 1487; Fishing Creek, N. C., 1489; Pamlico and Tar rivers, N. C., 1490; Contentnia Creek, N. C., 1492; Trent River, N. C., 1493; Neuse River, N. C., 1495; inland waterway between Newbern and Beaufort, N. C., via Clubfoot, Harlowe, and Newport rivers, 1497; harbor at Beaufort, N. C., 1498; inland waterway between Beaufort Harbor and New River, N. C., 1499; New River, N. C., 1501; Black River, N. C., 1502; Northeast (Cape Fear) River, N. C., 1504; Cape Fear River above Wilmington, N. C., 1505; Cape Fear River at and below Wilmington, N. C., 1507; Town Creek, Brunswick County, N. C., 1515; removing sunken vessels or craft obstructing or endangering navigation, 1516.

APPENDIX N.

REPORT OF MAJ. E. H. RUFFNER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Waccamaw River, N. C. and S. C., 1517; Little Pedee River, S. C., 1521; Great Pedee River, S. C., 1523; Georgetown Harbor, S. C., 1526; Winyah Bay, S. C., 1527; Santee River, S. C., 1532; Wateree River, S. C., 1536; Congaree River, S. C., 1539; Congaree River, S. C., from Gervais Street Bridge, Columbia, to Granby, harbor at Charleston, including Sullivan Island and Mount Pleasant shore, S. C., 1542; Wappoo Cut, S. C., 1546; Beaufort River, S. C., 1548; removing sunken vessels or craft obstructing or endangering navigation, 1550.

SURVEY.—Entrance to Charleston Harbor, S. C., 1551.

APPENDIX O.

REPORT OF CAPT. CASSIUS E. GILLETTE, CORPS OF ENGINEERS.

IMPROVEMENTS.—Savannah Harbor, Ga., 1559; Savannah River between Augusta and Savannah, Ga., 1567; Savannah River above Augusta, Ga., 1571; Doboy Bar, Ga., 1573; Darien Harbor, Ga., 1574; Altamaha River, Ga., 1578; Oconee River, Ga., 1580; Ocmulgee River, Ga., 1582; Brunswick Harbor, Ga., 1585; inside water route between Savannah, Ga., and Fernandina, Fla., 1590; removing sunken vessels or craft obstructing or endangering navigation, 1592.

APPENDIX P.

REPORT OF CAPT. C. H. McKINSTRY, CORPS OF ENGINEERS.

IMPROVEMENTS.—Cumberland Sound, Ga. and Fla., 1593; St. Johns River, Fla., from Jacksonville to the ocean, 1597; St. Johns River at Orange Mills Flats, Fla., 1600; Volusia Bar, Fla., 1602; Ocklawaha River, Fla., 1603; St. Augustine Harbor, Fla., 1607; Indian River, Fla., 1608; harbor at Key West, Fla., and entrance thereto, 1610; removing the water hyacinth from Florida waters, 1612; dredge for river and harbor improvements, Fla., 1613.

SURVEY.—Removing water hyacinths from navigable waters of Florida and Louisiana, 1618.

APPENDIX Q.

REPORT OF CAPT. HENRY JERVEY, CORPS OF ENGINEERS.

IMPROVEMENTS.—Caloosahatchee River, Fla., 1625; Charlotte Harbor and Pease Creek, Fla., 1626; Sarasota Bay, Fla., 1629; Manatee River, Fla., 1630; Tampa Bay, Fla., 1632; Hillsboro Bay, Fla., 1635; Anclote River, Fla., Withlacoochee River, Fla., 1638; Suwanee River, Fla., 1639.

SURVEY.—Tampa Bay, Fla., from Port Tampa to mouth of bay, in Gulf of Mexico, 1640.

HARBOR LINES.—Hillsboro River at Tampa, Fla., 1643.

APPENDIX R.

REPORT OF CAPT. C. A. F. FLAGLER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Carrabelle Bar and Harbor, Fla., 1647; Apalachicola Bay, Fla., 1649; Apalachicola River, the Cut-off, and lower Chipola River, Fla., 1653; upper Chipola River, Fla., from Marianna to its mouth. 1655; Flint River, Ga., 1657; Chattahoochee River, Ga. and Ala., 1660; Choctawhatchee River, Fla. and Ala., 1664; La Grange Bayou, Fla., including Holmes River, from Vernon to its mouth, 1666; Pensacola Harbor, Fla., 1668; Blackwater River, Fla., 1673; Escambia and Conecuh rivers, Fla. and Ala., 1674; Alabama River, Ala., 1676; Coosa River, Ga. and Ala., 1682; operating and care of canals and other works of navigation on Coosa River, Ga. and Ala., 1692.

APPENDIX S.

REPORT OF MAJ. WM. T. ROSSELL, CORPS OF ENGINEERS.

IMPROVEMENTS.—Harbor at Mobile, Ala., 1696; Black Warrior River, Ala., from Tuscaloosa to Daniels Creek, 1702; operating and care of locks and dams on Black Warrior River, Ala., 1703; Warrior and Tombigbee rivers, Ala. and Miss., 1707; Noxubee River, Miss., 1716; Pascagoula River, Miss., 1717; Pascagoula River and Horn Island Harbor, Miss., 1718; Chickasahay River, Miss., 1720; Leaf River, Miss., 1721; channel from Gulfport to Ship Island Harbor, Miss., 1722 Ship Island Pass, Miss., 1723; Pearl River at its mouth, Miss., 1724; Pearl River below Jackson, Miss., 1725; Pearl River between Carthage and Jackson, Miss., 1727; Pearl River between Edinburg and Carthage, Miss., 1728; Bogue Chitto, La., 1729; canal between Warrior River and Five-mile Creek, Ala., 1730; removing sunken vessels or craft obstructing or endangering navigation, 1783.

SURVEYS.—Horn Island Pass and Harbor, Miss., 1784; channel through Ship Island Pass, and from Ship Island Harbor to Gulfport and to Biloxi, Miss., 1787.

APPENDIX T.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

INSPECTION of the improvement of the South Pass of the Mississippi River, 1815.

APPENDIX U.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Chefuncte River and Bogue Falia, La., 1833; Tickfaw River and its tributaries, La., 1835; Amite River and Bayou Manchac, La., 1837; closing crevasse in Pass a Loutre, Mississississippi River, 1839; improvement of the outlet of the Mississippi River at Pass a Loutre, 1841; Bayou Lafourche, La., 1842; Bayou Plaquemine, Grand River, and Pigeon bayous, La., 1844; Bayou Courtableau, La., 1847; Bayou Teche, La., 1848; channel, bay, and passes of Bayou Vermilion, La., 1850; Mermentau River and tributaries, La., 1851; mouth and passes of Calcasieu River, La., 1853; Johnsons Bayou, La., removing water hyacinths from Louisiana waters, 1855; mouths of Sabine and Neches rivers, Tex. 1856; Sabine River, Tex., 1857; harbor at Sabine Pass, Tex., 1858; Homochitto, River, Miss., 1862.

SURVEY.—Southwest Pass, Mississippi River, 1863.

APPENDIX V.

REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS.

IMPROVEMENTS.—Galveston Harbor, Tex., 1953; ship channel in Galveston Bay, Tex., 1961; channel from Galveston Harbor to Texas City, Tex., 1962; Galveston ship channel and Buffalo Bayou, Tex., 1964; operating and care of Morgan Canal, Tex., Trinity River, Tex., 1965; Buffalo Bayou, Tex., 1967; channel in West Galveston Bay, Tex., 1968; mouth of Brazos River, Tex., 1969; Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and mouths of adjacent streams, Tex., Brazos River, Tex., 1970; Aransas Pass, Tex., removing sunken vessels or craft obstructing or endangering navigation, 1972.

SURVEYS.—Aransas Pass and Harbor, Tex., 1973; mouth of Brazos River, near Velasco, Tex., 1976.

APPENDIX W.

REPORT OF MAJ. J. H. WILLARD, CORPS OF ENGINEERS.

IMPROVEMENTS.—Red River, La., Ark., and Ind. T., 1979; Red River above Fulton, Ark., 1991; Cypress Bayou, Tex. and La., 1992; Ouachita and Black rivers, Ark. and La., 1994; Bayou Bartholomew, La. and Ark., 2000; Bœuf River, La., 2002; Tensas River and Bayou Maçon, La., 2006; Yazoo River, Miss., 2009; mouth of Yazoo River and harbor at Vicksburg, Miss., 2015; Tallahatchie River, Miss., 2020; Big Sunflower River, Miss., 2022; water gauges on the Mississippi River and its principal tributaries, 2025.

APPENDIX X.

REPORT OF LIEUT. ROBERT McGREGOR, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing obstruction in Arkansas River, Ark. and Kans., 2031; Arkansas River, Ark., 2033; White River, Ark., 2035; Buffalo Fork of White River, Ark., 2037; Upper White River, Ark., 2038; Cache River, Ark., 2039; Black River, Ark. and Mo., 2040; Current River, Ark. and Mo., 2042; St. Francis River, Ark., 2043; St. Francis River, Mo., 2045.

PART III.

APPENDIX Y.

REPORT OF CAPT. EDW. BURR, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing snags and wrecks from the Mississippi River below the mouth of the Missouri River, 2047; Mississippi River between Ohio and Missouri Rivers, 2058; harbor at St. Louis, Mo., 2087; to prevent the Mississippi River from breaking through into Cache River at Beechridge, above Cairo, Ill., 2088.

APPENDIX Z.

REPORT OF CAPT. C. McD. TOWNSEND, CORPS OF ENGINEERS.

IMPROVEMENTS.—Operating snag boats and dredge boats on Upper Mississippi River, 2091; Mississippi River between mouth of Missouri River and St. Paul, 2102; operating and care of Des Moines Rapids Canal and Dry Dock, 2160; operation and care of Galena River improvement, Ill., 2168; harbor at La Crosse, Wis., 2171.

APPENDIX A A.

REPORT OF MAJ. FREDERIC V. ABBOT, CORPS OF ENGINEERS.

IMPROVEMENTS.—Mississippi River, between St. Paul and Minneapolis, Minn., 2173; construction of reservoirs at head waters of Mississippi River, 2182; operating and care of reservoirs at head waters of Mississippi River, 2190; Chippewa River, including yellow banks, Wis., 2195; St. Croix River, Wis. and Minn., 2197; Minnesota River, Minn., Red River of the North, Minn. and N. Dak., 2200; bar at mouth of Warroad River, Minn., 2204; gauging Mississippi River at or near St. Paul, Minn., 2205.

APPENDIX B B.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

IMPROVEMENTS.—Missouri River between Stubbs Ferry, Mont., and lower limits of Sioux City, Iowa, 2217; snagging Upper Missouri River, 2229; Yellowstone River, Mont. and N. Dak., 2231.

APPENDIX C C.

REPORT OF LIEUT. COL. M. B. ADAMS, CORPS OF ENGINEERS.

IMPROVEMENTS.—Obion River, Tenn., 2233; Forked Deer River, Tenn., 2235; Cumberland River, Tenn. and Ky., 2238.

APPENDIX D D.

REPORT OF MAJ. DAN C. KINGMAN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Tennessee River system, 2251: Tennessee River, 2252; operating and care of Muscle Shoals Canal. Tennessee River, 2289; French Broad and Little Pigeon rivers. Tenn., 2300; Clinch River, Tenn. and Va., 2303; Elk River, Tenn. and Ala., 2306.

SURVEY.—Elk River, Tenn. and Ala., 2308.

APPENDIX E E.

REPORT OF MAJ. WM. H. BIXBY, CORPS OF ENGINEERS.

IMPROVEMENTS.—Ohio River, 2311; operating snag boat on the Ohio River, 2340; operating and care of Davis Island Dam, Ohio River, near Pittsburg, Pa., 2347; movable dams in Ohio River, 2352.

SURVEYS.—Ohio River, from Marietta, Ohio, to Pittsburg, Pa., final report, 2361; Ohio River at Cullums Ripple, below Cincinnati, Ohio, 2367.

APPENDIX F F.

REPORT OF MAJ. CHAS. F. POWELL, CORPS OF ENGINEERS.

IMPROVEMENTS.—Monongahela River, W. Va. and Pa., 2373, 2375; operating and care of locks and dams on Monongahela River, W. Va. and Pa., 2376; harbor of Pittsburg, Pa., 2397; locks and dams at Herr Island, above head of Six-mile Island, and at Springdale, Allegheny River, Pa., 2404; open-channel improvement, Allegheny River, Pa., 2410.

SURVEY.—Allegheny River, Pa., 2411.

HARBOR LINE.—Ohio River at Allegheny City, Pa., 2449.

APPENDIX G G.

REPORT OF CAPT. H. F. HODGES, CORPS OF ENGINEERS.

IMPROVEMENTS.—Muskingum River, Ohio, 2454; operating and care of locks and dams on Muskingum River, Ohio, 2457; Little Kanawha River, W. Va., 2474; operating and care of lock and dam on Little Kanawha River, W. Va., 2476; Great Kanawha River, W. Va., 2479; operating and care of locks and dams on Great Kanawha River, W. Va., 2485; Elk River, W. Va., 2495; Gauley River, W. Va., 2496; New River, Va. and W. Va., 2498; Guyandotte River, W. Va., 2499; Big Sandy River, W. Va. and Ky., 2501: operating and care of lock and dam in Big Sandy River, W. Va. and Ky., 2505; Tug Fork of Big Sandy River, W. Va. and Ky., 2508; Levisa Fork of Big Sandy River, Ky., 2511; Kentucky River, Ky., 2513; operating and care of locks and dams in Kentucky River, Ky., 2523.

APPENDIX H H.

REPORT OF CAPT. GEO. A. ZINN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Falls of Ohio River at Louisville, Ky., 2545; operating and care of Louisville and Portland Canal, Louisville, Ky., 2565; Wabash River, Ind. and Ill., 2577; operating and care of lock and dam at Grand Rapids, Wabash River, 2578; White River, Ind., 2580; Lock No. 2, Green River, at Rumsey, Ky., 2581; Green River above mouth of Big Barren River, Ky. (Lock No. 5), 2583; operating and care of locks and dams on Green and Barren rivers, Ky., 2584; Rough River, Ky., 2599; operating and care of lock and dam in Rough River, Ky., 2602.

APPENDIX I I.

REPORT OF MAJ. CLINTON B. SEARS, CORPS OF ENGINEERS.

IMPROVEMENTS.—Harbor at Grand Marais, Minn., 2605; harbor at Agate Bay, Minn., 2608; harbor at Duluth, Minn., and Superior, Wis., 2611; harbor at Ashland, Wis., 2703; harbor at Ontonagon, Mich., 2705; waterway from Keweenaw Bay to Lake Superior, Mich., 2707; harbor at Marquette, Mich., 2715: harbor of refuge, Marquette Bay, Mich., 2718; harbor of refuge, Grand Marais, Mich., 2719; removing sunken vessels or craft obstructing or endangering navigation, 2722.

HARBOR LINE.—Portage Lake at Houghton, Mich., 2723.

PART IV.

APPENDIX J J.

REPORT OF CAPT. J. G. WARREN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Menominee Harbor, Mich. and Wis., 2726; Menominee River, Mich. and Wis., 2728; Oconto Harbor, Wis., 2731; Pensaukee Harbor, Wis., Green Bay Harbor, Wis., 2734; Sturgeon Bay and Lake Michigan Ship Canal, Wis., 2737; operating and care of Sturgeon Bay and Lake Michigan Ship Canal, Wis., 2743; harbor of refuge, Sturgeon Bay Canal, Wis., 2749; Ahnapee Harbor, Wis., 2751; Kewaunee Harbor, Wis., 2754; Two Rivers Harbor, Wis., 2756; Manitowoc Harbor, Wis., 2759; Sheboygan Harbor, Wis., 2762; Port Washington Harbor, Wis., 2765; harbor of refuge at Milwaukee, Wis., 2767; Milwaukee Harbor, Wis., 2770; South Milwaukee Harbor, Wis., 2775; Racine Harbor, Wis., 2776; Kenosha Harbor, Wis., 2781; Waukegan Harbor, Ill., 2786; Fox River, Wis., 2789; operating and care of locks and dams on Fox River, Wis., 2794; removing sunken vessels or craft obstructing or endangering navigation, 2812.

SURVEYS.—Sheboygan Harbor, Wis., 2812; Racine Harbor, Wis., 2815; Kenosha Harbor, Wis., 2817.

HARBOR LINE.—Fox River, at Oshkosh, Wis., 2819.

APPENDIX K K.

REPORT OF MAJ. W. L. MARSHALL, CORPS OF ENGINEERS.

IMPROVEMENTS.—Chicago Harbor, Ill., 2821; Chicago River, Ill., 2826; removal of wreck of schooner *John Ruber* from North Branch, Chicago River, Ill., 2833, 2866; Calumet Harbor, Ill., 2833; Calumet River, Ill. and Ind., 2838; Illinois River, Ill., 2841; operating and care of Lagrange and Kampsville Locks, Illinois River, Ill., and approaches thereto, 2849; Illinois and Mississippi Canal, 2853; operating and care of Illinois and Mississippi Canal around rapids of Rock River at Milan, Ill., 2888.

SURVEY.—Upper Illinois and Lower Des Plaines rivers, Ill., 2890.

HARBOR LINE.—Calumet Harbor, Ill., 2891.

APPENDIX L L.

REPORT OF CAPT. CHESTER HARDING, CORPS OF ENGINEERS.

IMPROVEMENTS.—Michigan City Harbor, Ind., 2895; St. Joseph Harbor, Mich., 2901; St. Joseph River, Mich., 2905; South Haven Harbor, Mich., 2906; Saugatuck Harbor, Mich., 2910; Kalamazoo River, Mich., 2912; harbor at Holland (Black Lake), Mich., 2913; harbor at Grand Haven, Mich., 2917; Grand River, Mich., 2920; Muskegon Harbor, Mich., 2928; White Lake Harbor, Mich., 2931; Pentwater Harbor, Mich., 2933; Ludington Harbor, Mich., 2936; harbor at Manistee, Mich., 2939; harbor of refuge, Portage Lake, Manistee County, Mich., 2942; Frankfort Harbor, Mich., 2944; harbor at Charlevoix, Mich., 2946; harbor at Petoskey, Mich., 2949; removing sunken vessels or craft obstructing or endangering navigation, 2951.

APPENDIX M M.

REPORT OF LIEUT. COL. G. J. LYDECKER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Ship channel connecting waters of the Great Lakes between Chicago, Duluth, and Buffalo, 2953; St. Marys River at the falls, Mich., 2960; St. Marys Falls Canal, Mich., 2965; Hay Lake Channel, St. Marys River, Mich., 2979; Cheboygan Harbor, Mich., 2982; Alpena Harbor (Thunder Bay River), Mich., 2983; Saginaw River, Mich., 2985; Sebewaing River, Mich., 2987; harbor of refuge, Sandbeach, Lake Huron, Mich., 2988; mouth of Black River, Mich., 2992; Black River at Port Huron, Mich., 2993; Pine River, Mich., 2995; Belle River, Mich., 2996; St. Clair Flats Canal, Mich., 2998; operating and care of St. Clair Flats Canal, Mich., 2999; Clinton River, Mich., 3001; Detroit River, Mich., 3003; Rouge River, Mich., 3013; turning basin in Rouge River, Mich., 3014; removing sunken vessels or craft obstructing or endangering navigation, 3015.

APPENDIX N N.

REPORT OF COL. JARED A. SMITH, CORPS OF ENGINEERS.

Improvements.—Monroe Harbor, Mich., 3017; Toledo Harbor, Ohio, 3020; Port Clinton Harbor, Ohio, 3034; Sandusky Harbor, Ohio, 3036; Huron Harbor, Ohio, 3051; Vermilion Harbor, Ohio, 3053; Black River (Lorain) Harbor, Ohio, 3055; Cleveland Harbor, Ohio, 3057; Fairport Harbor, Ohio, 3064; Ashtabula Harbor, Ohio, 3068; Conneaut Harbor, Ohio, 3071; removing sunken vessels or craft obstructing or endangering navigation, 3075.
Survey.—Cleveland Harbor, Ohio, 3075.
Harbor Lines.—Toledo Harbor, Ohio, 3078; Cleveland Harbor, Ohio, 3080.

APPENDIX O O.

REPORT OF MAJ. THOMAS W. SYMONS, CORPS OF ENGINEERS.

Improvements.—Erie Harbor, Pa., 3091; Dunkirk Harbor, N. Y., 3096; Buffalo Harbor, N. Y., 3101; Buffalo entrance to Erie Basin and Black Rock Harbor, N. Y., 3114; Tonawanda Harbor and Niagara River, N. Y., 3115; Niagara River from Tonawanda to Port Day, N. Y., 3121.
Harbor Line.—Outer harbor at Buffalo, N. Y., including West Seneca, 3123.

APPENDIX P P.

REPORT OF CAPT. GRAHAM D. FITCH, CORPS OF ENGINEERS.

Improvements.—Wilson Harbor, N. Y., 3129; harbor at Charlotte, N. Y., 3130; harbor at Pultneyville, N. Y., 3132; harbor at Great Sodus Bay, N. Y., 3133; harbor at Little Sodus Bay, N. Y., 3135; harbor at Oswego, N. Y., 3138; harbor at Cape Vincent, N. Y., 3145; shoals in the St. Lawrence River, between Ogdensburg and the foot of Lake Ontario, 3147; harbor at Ogdensburg, N. Y., 3149.

APPENDIX Q Q.

REPORT OF CAPT. JAMES J. MEYLER, CORPS OF ENGINEERS.

Improvements.—San Diego Harbor, Cal., 3153; deep-water harbor at San Pedro Bay, Cal., 3156; Wilmington Harbor, Cal., 3158; San Luis Obispo Harbor, Cal., 3159.

APPENDIX R R.

REPORT OF MAJ. W. H. HEUER, CORPS OF ENGINEERS.

Improvements.—Harbor at Alviso, Cal., 3161; harbor at San Francisco, Cal., 3162; Oakland Harbor, Cal., 3163; San Joaquin River, Cal., 3166; Mokelumne River, Cal., 3168; Sacramento and Feather rivers, Cal., 3169; Napa River, Cal., 3182; Petaluma Creek, Cal., 3183; Humboldt Harbor and Bay, Cal., 3185; removing sunken vessels or craft obstructing or endangering navigation, 3188.
Survey.—San Joaquin River and Stockton and Mormon channels, Cal., 3188.
Harbor Lines.—Eastern shore of San Francisco Bay, between Point San Pablo and Oakland, Cal., 3194.

APPENDIX S S.

REPORT OF CAPT. WILLIAM W. HARTS, CORPS OF ENGINEERS.

Improvements.—Port Orford Harbor, Oreg., 3199; mouth of Coquille River, Oreg., 3200; Coquille River, Oreg., between Coquille and Myrtle Point, 3202; entrance to Coos Bay and Harbor, Oreg., 3203; dredging Coos Bay, Oreg., 3205; Coos River, Oreg., 3208; Umpqua River, Oreg., 3209; mouth of Siuslaw River, Oreg., 3210; Alsea River, Oreg., Yaquina Bay, Oreg., 3212; examination of Yaquina Bay, Oreg., 3215; Nestugga River, Oreg., 3216; Tillamook Bay and Bar, Oreg., 3217; Upper Columbia and Snake rivers, Oreg. and Wash., 3219; Columbia River at Three-mile Rapids, and boat railway from The Dalles Rapids to Celilo Falls, 3221; canal at the Cascades, Columbia River, Oreg., 3222; operating and care of canal and locks at the Cascades, Columbia River, Oreg., 3224; Columbia River between Vancouver, Wash., and mouth of Willamette River, 3229; Clearwater River, Idaho, 3231.

APPENDIX T T.

REPORT OF MAJ. W. L. FISK, CORPS OF ENGINEERS.

IMPROVEMENTS.—Long Tom River, Oreg., 3233; Willamette River above Portland, and Yamhill River, Oreg., 3234; Columbia and Lower Willamette rivers below Portland, Oreg., 3239; Columbia River below Tongue Point, 3245; mouth of Columbia River, Oreg. and Wash., 3246; Clatskanie River, Oreg., 3247; Lewis River, Wash., 3248; Cowlitz River, Wash., 3249; gauging waters of Columbia River, Oreg. and Wash., 3250.

HARBOR LINES.—Willamette River at Albina, Portland Harbor, Oreg., 3251.

APPENDIX U U.

REPORT OF CAPT. HARRY TAYLOR, CORPS OF ENGINEERS.

IMPROVEMENTS.—Willapa River and Harbor, Wash., 3259; Grays Harbor and bar entrance, Wash., 3261; Chehalis River, Wash., 3266; Puget Sound and its tributary waters, Wash., 3267; harbor at Olympia, Wash., 3270; waterway connecting Puget Sound with lakes Union and Washington, 3271; Everett Harbor, Wash., 3273; Swinomish Slough, Wash., 3274; Okanogan River, Wash., 3275; Pend Oreille River, Wash., Kootenai River, Idaho, between Bonners Ferry and the international boundary line, 3276; Kootenai River, above Jennings, Mont., 3277; Flathead River, Mont., 3280.

APPENDIX V V.

REPORT OF LIEUT. COMMANDER J. C. FREMONT, U. S. NAVY.

SUPERVISION of the harbor of New York, N. Y., 3281.

PART V.

APPENDIX W W.

REPORT OF THE MISSISSIPPI RIVER COMMISSION.

G. L. GILLESPIE, colonel, Corps of Engineers, U. S. A., president; Amos Stickney, lieutenant-colonel, Corps of Engineers, U. S. A.; Thos. H. Handbury, major, Corps of Engineers, U. S. A.; Messrs. Henry L. Marindin, assistant, United States Coast and Geodetic Survey, B. M. Harrod, Robert S. Taylor, and J. A. Ockerson, *Commissioners*.

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Amos Stickney, lieutenant-colonel, Corps of Engineers, U. S. A., president; Thos. H. Handbury, major, Corps of Engineers, U. S. A.; W. L. Marshall, major, Corps of Engineers, U. S. A.; Messrs. G. C. Broadhead and C. L. Chaffee, *Commissioners.*

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ANNUAL REPORT OF THE MISSOURI RIVER COMMISSION FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

Office Missouri River Commission,
St. Louis, Mo., July 12, 1899.

Sir: The Missouri River Commission beg leave to submit herewith their annual report for the fiscal year ending June 30, 1899.

ORGANIZATION AND MEETINGS OF THE COMMISSION.

No change occurred in the personnel of the Commission, which remained throughout the year as follows:

Lieut. Col. Amos Stickney, Corps of Engineers, U. S. A., president.
Mr. Garland C. Broadhead.
Maj. Thomas H. Handbury, Corps of Engineers, U. S. A.
Mr. C. L. Chaffee.
Maj. William L. Marshall, Corps of Engineers, U. S. A.

The duties of secretary were performed by the president of the Commission under Special Orders, No. 126, Adjutant-General's Office, Washington, D. C., dated May 30, 1898, until December 31, when they were assumed by Capt. Graham D. Fitch, Corps of Engineers, in accordance with Special Orders, No. 232, Adjutant-General's Office, Washington, D. C., dated October 1, 1898. On the 15th of February, 1899, Captain Fitch was relieved by Capt. H. M. Chittenden, Corps of Engineers, U. S. A., pursuant to Special Orders, No. 32, Adjutant-General's Office, Washington, D. C., dated February 8, 1899.

The Commission held three meetings during the year, viz, July 11-12, and October 27-29, 1898, and March 14, 1899. The Commission made two tours of inspection on the river during the year, one between August 25 and September 2, and the other between October 25 and 29.

APPROPRIATIONS AND ALLOTMENTS.

In the approved allotments from the appropriations of July 1, 1898, there have been no changes.

The urgent deficiency act, approved January 5, 1899, contained the following item:

> For continuing and completing the work of protecting the bank in Pelican Bend, Missouri River, one hundred thousand dollars. And this sum shall be deducted from the sum of three hundred thousand dollars authorized to be appropriated and expended for continuing improvement of the Missouri River from its mouth to Sioux City, Iowa, for the fiscal year ending June thirtieth, nineteen hundred, by the "Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," which became a law on June third, eighteen hundred and ninety-six.

The river and harbor act, approved March 3, 1899, contained the following items:

For improving the Missouri River from its mouth to Sioux City, Iowa, according to plans and specifications of the Missouri River Commission, one hundred thousand dollars: *Provided*, That of this amount the following sums, or so much thereof as may be necessary, in the discretion of the Secretary of War, shall be expended for continuing improvements at the following places, namely: For work at the mouth of the Kaw River, in Missouri, five thousand dollars; for work on the right bank above the mouth of Little Blue River, in Missouri, five thousand dollars; for work above Glasgow, Missouri, ten thousand dollars; for work near Huntsdale, Missouri, ten thousand dollars; for local work above Kansas City, Missouri, not yet completed, twenty thousand dollars; for repairs on works and contingencies, fifteen thousand dollars: *Provided also*, That of the said amount of one hundred thousand dollars the sum of thirty-five thousand may be expended in operating snag boats on the Missouri River between Sioux City and its mouth, in removing snags, wrecks, and other obstructions.

Improving Gasconade River, Missouri: Continuing improvement, fifteen thousand dollars.

Improving Osage River, Missouri, by the construction of a lock and dam, in accordance with the plan and estimate submitted by the Missouri River Commission in their report of July twelfth, eighteen hundred and ninety-eight, and printed in Volume Six of the Report of the Chief of Engineers for the year eighteen hundred and ninety-eight, twenty-five thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such work and materials as may be necessary for the completion of such lock and dam, or the materials may be purchased and the work done otherwise than by contract, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and forty-six thousand dollars, exclusive of the amount herein and heretofore appropriated.

The sundry civil act, approved March 3, 1899, contained the following item:

Improving Missouri River from mouth to Sioux City, Iowa: For continuing improvement of Missouri River from its mouth to Sioux City, Iowa, including salaries, clerical, office, traveling, and miscellaneous expenses of the Missouri River Commission, surveys, permanent bench marks, and gauges, two hundred thousand dollars: *Provided*, That of this amount the following sums, or so much thereof as may be necessary, in the discretion of the Secretary of War, shall be expended in works of improvement at the following places, namely: Saint Joseph, Missouri, thirty thousand dollars; Omaha, Nebraska, and Council Bluffs, Iowa, fifty thousand dollars; opposite Leavenworth, Kansas, five thousand dollars; Jefferson City, Missouri, twenty thousand dollars to improve the harbor at Jefferson City by compelling the current and channel of the river to the southside thereof; Nigger Bend, Missouri, ten thousand dollars; Randolph Bend, Missouri, fifteen thousand dollars; Lexington, Missouri, ten thousand dollars.

At its meeting of the 14th of March, 1899, the Commission recommended the following allotments from the above appropriations, which were approved by the Chief of Engineers and Secretary of War:

From river and harbor act:

For work at the mouth of the Kaw River	$1,000
For work on the right bank above the mouth of Little Blue River	5,000
For work above Glasgow, Mo	10,000
For work near Huntsdale, Mo	1,000
For work, local works above Kansas City, Mo	16,000
For work in first reach	13,500
For work, repairs and contingencies	15,000
For work, operating snag boat	25,000
For new plant	4,500
For general office expenses	9,000
	100,000

From the sundry civil act:

For work at Omaha and Council Bluffs	40,000
For work at St. Joseph, Mo	24,000
For work opposite Leavenworth, Kans	2,000
For work at Randolph Bend, Mo	12,000

From the sundry civil act—Continued.

For work above mouth of Little Blue River	$10,000
For work at Lexington, Mo	8,000
For work above Glasgow, Mo	8,000
For work at Nigger Bend, Mo	8,000
For work at Jefferson City, Mo	16,000
For new plant	13,500
For repair and contingencies	35,000
For surveys, gauges, physical data, etc	10,500
For salaries of the commission, travel and general office expenses	13,000
	200,000

The sum appropriated in the urgent deficiency act was specifically appropriated for the work at Pelican Bend, and no allotment by the commission was necessary.

SURVEYS AND EXAMINATIONS.

Under the project for a topographical survey of the Missouri River Valley between bluff lines from the mouth to Sioux City, Iowa, adopted by the commission September 6, 1894, no field work was done during the year, and the only work performed was the completion of the charts of the surveys of previous years.

These charts are fourteen in number, drawn to a scale of 1,000 feet to 1 inch, and embrace surveys made from 1894 to 1897, inclusive, covering the river from its mouth to 10 miles above Kansas City, Mo., a river distance of 400 miles.

The charts cover thoroughly all of the valley within 1½ to 2 miles of the river, except where the bluffs lie nearer than those distances, and where the bluffs are farther away they have been separately located and platted; contour lines on the low ground are shown at 5-foot intervals, and on the bluffs at 20-foot intervals. For further details, see report of Asst. Engineer A. H. Blaisdell, Appendix A.

GAUGES AND PHYSICAL DATA.

On the Missouri River 22 permanent water gauges were maintained throughout the year independently of those maintained in connection with works of improvement, their records being reported weekly to this office.

Through the courtesy of the engineer officer in charge of the river above Sioux City, the weekly records of the gauges at Bismarck, N. Dak., Townsend, Mont., and Fort Benton, Mont., were also furnished during portions of the year.

Hydrographs of all the gauges were kept platted to date and any errors made manifest were at once traced and corrected.

There were but few inexpensive repairs needed on any of the gauges during the period of their maintenance.

During the fall one inspection trip was made.

The assistant making this trip, in addition to the inspection of gauges, was charged with other duties, such as the collection of commercial statistics, the inspection and measurement of bridges, and other work requiring the services of an engineer.

Of the 12 pilot bulletins maintained between the mouth and Kansas City, the one at Kansas City was continued throughout the entire year at the written request of local steamboat interests, but the others were discontinued during the months of December, January, February, and March.

All the bulletins read from a stage 5 feet below standard low water, and dating from January 1, 1898, when the United States Weather Bureau lowered the zero elevation of their Hermann gauge to 68.2 feet above the St. Louis directrix, the bulletin readings practically correspond with the published records of the Weather Bureau.

The four permanent gauges on the Osage and the one on the Gasconade were continued without interruption. For further details regarding the gauges see report of Asst. Engineer A. H. Blaisdell, Appendix B.

REMOVAL OF OBSTRUCTIONS.

The snag boat *Charles R. Suter* was in commission from August 15 to November 19, and from March 18 to April 25, during which time she was engaged in removing snags and other obstructions from the river, and on inspection trips by the Commission.

During the year 430 snags were removed and 80 trees cut from the banks. The distance run on this work and on the inspection trips was 2,298 miles.

COMMERCE.

The statistics of commerce were collected as usual during the fiscal year. They show the following comparison with the fiscal year ending June 30, 1898:

	Mile-tons carried in 1899.	Mile-tons carried in 1898.
Missouri River	1,929,561	1,736,485
Osage River	4,175,054	3,885,895
Gasconade River	1,832,268	2,209,902

For tables of statistics see report of Asst. Engineer A. H. Blaisdell, Appendix C.

CONSTRUCTION.

NEBRASKA CITY, NEBR.

The only work done at this point during the year consisted in the revetment of the bank for 210 feet above Dike No. 1 to prevent the action of a strong eddy which had developed at that point and which threatened the flanking of the dike. About the 24th of June the outer end of Dike No. 5 was carried away by the flood, including all the curved portion except four bents at the lower end.

ST. JOSEPH REVETMENT REPAIRS.

These include the revetments in Bon Ton, Belmont, and Elwood bends.

The original work in Bon Ton Bend was begun in 1881, and it was finally completed, with a total length of 19,331 feet, in 1889. Repairs have been made at various times in previous years, covering 7,866 feet of the revetment. During the past year repairs were made at five points, making an aggregate length of 1,955 feet.

The Belmont Bend revetment, 14,992 feet long, was constructed in 1891. Previous to the last fiscal year repairs to the revetment were made on about 4,364 feet of its length. During the past year a length of 2,270 feet was repaired.

The Elwood Bend revetment, to a length of 10,240 feet, was built in 1879 of detached frame mattresses. In 1881 and 1882 over 4,000 feet of this work was destroyed. This was replaced in 1882 by wire and brush mattress revetment.

The river has since been diverted from a portion of this revetment, which is no longer subjected to the action of the current. During the past year repairs have been made at three breaks, aggregating 1,080 feet.

OPPOSITE LEAVENWORTH, KANS.

At this point a dike was constructed for the purpose of cutting off the flow across the accretions below Dike No. 2, constructed in 1895, and of impounding the water in the old shore channel along the left bank, with a view of preventing erosion along the work placed by the Leavenworth Bridge and Terminal Company on the east bank for the protection of their bridge at this point. A portion of this material was collected during the fall and winter of 1898–99, and the work was done in April and May last. The dike is two-row work, 350 feet in length, with an inshore extension of 270 feet, composed of brush screens supported on poles.

MOUTH OF KAW RIVER.

The work at this point consisted in the construction of two low dikes designed to contract and deepen the channel of the Kaw at its mouth. The object was to remove obstruction to the discharge of the river which had been caused by changes of recent years in the channel of the Missouri at this point. The dikes consist of two rows of braced piles in 10-feet bents. Dike A contains 16 bents and Dike B 14 bents. The work was mainly done in November and December, 1898, and resumed March 30, 1899, but is not yet entirely completed.

EAST BOTTOMS (MO.) REVETMENT.

This revetment, 9,000 feet long, was built in 1887. A considerable settling had occurred near the lower end of the revetment, and although the breaks were not serious it was deemed advisable to repair them before they should become so. The work was begun in November, 1898, and completed in March and April, 1899. It included the repair of about 770 linear feet of revetment.

LITTLE BLUE REACH.

Bankhead 3 A.—A violent eddy had developed below this bankhead at the date of last Annual Report and was seriously threatening the structure. Its action was checked by means of three short spurs of brush weighted with stone, built into the pocket formed by the eddy. A length of 103 feet of the lower end of the bankhead was lost. The repair of this break was done in August and September, by means of two-row pile work with the usual mattress bracing and curtains. An extensive remodeling of the structure was commenced September 13 and finished November 17. It included the lowering of the outer wall to an elevation of 2 feet above standard low water, the removal of all stone back of the post circle, the cutting down of the earth to a berm 50 feet in width, and the paving of this berm with stone 12 inches thick with a slope from 6 feet above standard low water at the inner line to 2 feet at the post circle. There was also constructed a portion of one of two groins of brush and stone designed to arrest the reef action to which the structure was exposed. The effect of the one which was not completed was very satisfactory and eliminated to a large degree the difficulty which they were designed to remove.

Bankhead 1 A.—A large part of the material for this structure was procured, but the work was not undertaken on account of the shoal water, which made construction impracticable at the time.

Dike 2 A.—The length of this dike is 1,140 feet. It slopes uniformly from standard high water at shore to 10 feet above standard low water at end. It contains 21 bents four-row work, and 94 bents three-row work. It was built during the months of August and September.

The effect of the dike was entirely satisfactory, but unfortunately it was breached during the high water of April, leaving a gap of 320 feet between bents 7 and 39, while the shore end was flanked by a channel 100 feet wide. The repair of this dike was attempted, but found impracticable during the stage of water prevailing at the time.

MIAMI REACH.

Dike 1 B.—The extension of this dike, 300 feet to its projected length of 1,800 feet, was done in September and October. It was all three-row work.

Bankhead 1 B.—During the month of September this structure was remodeled and extended. The width of the berm was increased, and a new outer wall of two-row pile work was built. The old wall was degraded to a height of 2 feet above standard low water at the outer edge, and to a height of 3 feet at the post circle. The upper arm, for a distance of 8 degrees beyond the old limits, was graded and paved.

GLASGOW REACH.

Bankhead 6 C.—This structure was attacked by a violent eddy about the middle of July, which caused considerable damage to the upper end of the structure, and even threatened to flank it. The damage was repaired in July and August. The outer wall was somewhat extended upstream. In October and November this structure was remodeled and extended practically the same as in the case of 3 A, with some modifications due to the stage of the water at the time that the work was going on. Sounding taken at the bankhead November 30 showed a deep trench around the outer wall, with a maximum depth of 35 feet below standard low water. The trench had the effect of concentrating the flow at this point with such high velocity as seriously to threaten the structure. An attempt was made to relieve the situation by building groins similar to those which had apparently been so successful at 3 A. The difficulties at 6 C were, however, far more serious. The work was much interrupted by the cold weather and running ice, and although it was continued during the winter and spring, the results at the date of this report are still doubtful. Late in April a light levee was thrown across the low ground above the bankhead to prevent overflow, but not being strong enough was breached by the high water. A new levee of sufficient size to insure its stability was constructed early in June. Late in the same month a line of abattis was constructed above the bankhead to aid in building up the bottom by deposit, with a view to future extension of the upper arm of the bankhead.

Dike 3 C.—This structure is 500 feet long, of four-row work for 27 bents, and three-row for the remainder. The grade for 30 bents from the shore was level and 13.25 feet above standard low water, dropping thence to 10 feet at the outer end. This work was done in October and November.

Bankhead 5 C.—Anticipating similar trouble to that experienced at bankhead 6 C, the construction of four groins was undertaken at this point—one in the eddy above the bankhead, one in that below, and the other two at intermediate points. The one below the bankhead was not built. The action of the upper groin in breaking up the eddy was very effective. At about the time of the completion of this groin certain changes in the regimen of the river produced an attack of extraordinary severity upon the bankhead, causing the upper groin to settle, and endangering the stability of the entire structure. To meet the emergency, a two-row pile extension of the post circle was ordered built along that portion of the bankhead where the action of the river was most dangerous. This work was in progress at the close of the year.

A levee 60 feet long was built back of this structure to a height of 19½ feet above standard low water to prevent flood water passing around it.

Bankhead 4 C.—This structure has not been in the line of active flow during the year, and no work has been done upon it.

Bankhead 2 C.—The construction of this bankhead was begun October 6, at the foot of Little Missouri Bend, and was left in an unfinished state. It presents some new features based upon experience in building other works of its class.

Dike 3 C.—Some damage was done to this work by the ice during the months of November and December, but it was promptly repaired at slight cost. During the spring flood about 200 feet of the outer end was carried away.

Abatis below Dike 3 C.—This work was designed to cause and maintain a high crossing into Wilhoites Bend. The work was begun June 23, but on account of the quantity of drift running was suspended on the 29th.

CAMBRIDGE BEND REVETMENT.

The lower end of this revetment had been partially destroyed, and was further threatened by a violent eddy which had developed at that point. To prevent further damage a curved line of 2-row pile work, extending from the revetment above the break to a point some distance below, was built in November last. Two radial curtains were also built from the pile work to the bank to cause the pocket to fill up.

ROCHEPORT REACH.

Bankhead 1 D.—Between the dates of October 8 and November 3, this structure was remodeled in a similar way to that of bankhead 3 A. The work stood well until early in June, when a part of it was carried away by the flood. Repairs of this break involving an extension of the bankhead according to plans previously prepared, but modified somewhat on account of the stage of the river at the time, were begun on the 25th of June, and were in progress at the close of the year.

HUNTSDALE REACH.

The project at this point contemplated the construction of two lines of abattis, aggregating 700 feet in length. The work was done during the month of December, and has accomplished the object for which it was designed in filling up the bend where the caving was going on. It is probable that additional work will be needed to protect the bend at a point farther downstream.

GASCONADE DIVISION.

NEW JUNCTION OF MISSOURI AND OSAGE RIVERS.

The operations at this point have consisted in the removal of deposits that had collected in the cut during the period of high water; in opening a new ditch 800 feet long beyond the north end of the cut; in the construction of three cross curtains designed to cause a deposit between the embankment and pile work of Dike 19½ A, and in the removal of various obstructions in the proposed waterway. The shore end of Dike 19 B was cut down to grade. Dike 19½ A was repaired. Some repairs were also made to the embankment where it had been injured by the floods. The conditions of high water have not yet been such as to develop the proposed new outlet of the Osage.

Dike XXIII.—A break in this dike was discovered on the 12th of August, but it is believed to have been caused by the previous flood. It was repaired in October.

Dike 16 A.—The outer 54 feet of this dike was cut down to a grade rising from 0.3 feet above standard low water to its old grade 7.9 feet.

Dike XXIV.—The bracing of this dike, which had never been put in, was constructed during the month of November.

Dike XI B.—A groin was built across a hole which had developed at the end of this dike. This work was done in the first week of April.

Hardin's Island.—A line of abatis 500 feet long was constructed at this point in November, with a view of eliminating the Hardins Island crossing. The work produced good results, although it did not fully accomplish the object proposed. Between November 18 and December 3 the line of abatis built in 1899 was extended 657 feet across the chute at the head of Hardins Island. This work suffered some damages from the succeeding high water, but they were repaired at slight expense.

Chamois Bankhead.—This structure, the first of its kind built, has withstood remarkably well the attacks of the river. The only work, except some minor repairs, that has been done upon it during the year consisted in the construction of two groins across the trench along the front of the bankhead, with a view to causing it to fill up. Changes in the regimen of the river which had become apparent early in August indicated that the channel was shifting away from the bankhead, but this tendency was in part counteracted by the abatis at Hardins Island.

HOWARDS BEND BEACH.

Bankhead 4 F.—Work on this structure consisted in fairing out the outer wall over a part of its length and reenforcing different parts of the work. This work was done between October 24 and November 3.

Bankhead 5 F.—Work on this structure consisted in some minor repairs, in fairing up the outer wall over a portion of its length, and in reenforcing the work at various points. This work was done between September 19 and October 22.

Bankhead 6 F.—Four groins were constructed at this bankhead, with the same objects in view as in the cases of bankheads 3 A and 6 C, and some work for the extension of the bankhead upstream. The attack upon the bankhead by the spring floods was very severe, but serious damage to the structure was prevented by the work done.

PELICAN BEND REVETMENT.

Between August 15 and December 8, 6,450 linear feet of revetment, standard specifications, was built at this point. During the latter part of the month of June preparations were in progress for the resumption and extension of this work under the appropriations of January 5, 1899.

DAMAGES.

The most important injuries sustained during the year by works under charge of the commission, in addition to those already mentioned, are as follows:

Council Bluff revetment.—During July, 1898, a large break, about 2,700 feet long, occurred at the head of the Council Bluffs revetment. This break was covered by a railroad company, whose tracks it protects. During the spring flood of 1899 another break of 1,600 feet occurred.

The floods of this year have continued for a longer period than usual and have subjected all work to severe strains.

PLANT.

No new plant of importance was acquired during the year. The existing plant was cared for as heretofore, and the necessary work for maintenance and repairs was done. In addition to the towboats belonging to the Government, four private boats were chartered at various times. There were wrecked and lost during the year three 100-foot barges. Provision has been made for increasing the plant this year by the building of twelve new barges.

SURVEYS AND REPORTS.

In connection with the progress of the work, frequent surveys were made showing the conditions at the various points, and also numerous special examinations and reports upon different localities.

For details of the work see the reports of Division Engineers Fox and Yonge, Appendices E and D, respectively; also reports of Division Engineer Fox, Appendices F and G.

OSAGE RIVER.

The project for the improvement of this stream, adopted in 1871, consisted in the removal of obstructions to navigation, such as snags and leaning timber, in deeping the channel over shoals by means of dredging, and in the construction of cross and wing dams to concentrate the water over the shoal places.

The original estimated cost of the project was $230,000, but afterwards the work was made to cover more ground than was originally intended, and for a number of years past no estimate of the cost of the improvement by this method has been rendered in the annual reports. From the nature of the project, which contemplates only temporary relief from year to year and the removal of obstructions which are constantly forming anew, no definite time can be fixed for its completion, and no estimate made for its ultimate cost. The improvement must be continuous, and the annual estimates must depend upon conditions as they arise.

The amount expended by the General Government under this project to June 30, 1899, is $232,135.22. There was no expenditure under the project during the past fiscal year. The result has been a temporary benefit to navigation along the river for a distance of about 245 miles above the mouth.

The construction of a lock and dam near the mouth of the river was authorized by the river and harbor act of September 19, 1890. Owing to the small amounts of money appropriated for its construction, only $50,000 once in two years, it was necessary to defer actual construction until a sufficient amount had accumulated to warrant commencement of work. With the exception of acquiring title to the necessary grounds and the erection of a lock house and office, nothing of importance was done until the summer of 1896. Work on the lock was then begun under contract. Before it had proceeded far, however, complications arose on account of the necessity of lowering the reference of the miter sill 5 feet. An equitable arrangement could not be made with the contractors for the additional work involved in this change. It was therefore decided to purchase their plant and to carry on the work directly by hired labor. The bargain was made and the contract surrendered June 30, 1896.

The original project, under which work had been carried on up to this time, contemplated a structure of stone masonry 376 feet long between quoins and 52 feet clear width. Before resuming work this project was modified so as to reduce the size of the lock to 220 feet by 42 feet and to substitute concrete for stone masonry in the construction. A complete revised project for the lock and a project for the dam were approved by the Chief of Engineers June 29, 1897. The total estimated cost, including previous expenditures, is $325,000. The amount expended by the General Government under this project to June 30, 1899, is $232,135.22, of which $2,575.89 was expended during the past fiscal year.

Under the new project active operations were carried on during the season of 1897 as far as the available funds would permit. The work on the lock was about three-fourths completed. The operations of the season are described in the annual report of the Commission for 1898.

During the working season of 1898 nothing was done beyond the care of plant and the preparation of plans, owing to the lack of funds. The river and harbor act of March 3, 1899, appropriated $25,000 for the work, and authorized contracts to the extent of $146,000. Under the provisions of the act, steps have been taken to continue the work to completion during the present season. On the 16th ultimo, a contract was entered into with Messrs. James S. Pollard and Joseph D. Wallace covering most of the work, while the rest will be done directly by hired labor and purchase of materials in open market.

Work was promptly begun under the contract as soon as it was approved. The high water will prevent actual work on the foundations until about the 1st of August; but the general work of preparation, such as the purchase and assembling of material, the repairs of plant, etc., is being carried on in the meanwhile. A considerable amount of excavation for the east abutment of the dam above the water line has also been done.

The work is under the charge of Capt. Hiram M. Chittenden, Corps of Engineers, secretary of the Commission, with Mr. F. B. Maltby, United States assistant engineer, in immediate supervision. For further details, see Mr. F. B. Maltby's report, Appendix H.

The following paragraph, relating to the importance, methods, and cost of future improvement, based upon a personal examination of the river by the officer in charge, is quoted from the last annual report of the Commission:

> It would appear that the commercial importance of this river will fully justify continuous improvement in the future; but that the costly method of locks and dams is not necessary in order to secure a good navigable stage at low water. The numerous works in 1872 and 1873, and repaired and extended in 1878–1881, were found to be in an almost perfect state of repair, and to have answered their purpose admirably. It is evident that a reasonable development of this system, with modifications suggested by actual experience, will answer all the requirements of the stream. It is estimated that the annual outlay for this purpose need not exceed $25,000.

For commercial statistics, see report of Asst. Engineer A. H. Blaisdell, Appendix O.

GASCONADE RIVER.

The project for the improvement of this stream, adopted in 1880, consisted in the removal of snags and logs from the channel, and of leaning timbers from the banks of the river where necessary, and the construction of wing dams and training walls to concentrate the flow of water upon the shoals to increase the depth over them.

From the nature of the project, which contemplates only temporary relief from year to year, and the removal of obstructions which are constantly forming anew, no definite time can be fixed for its completion, and no estimate made of its ultimate cost. The improvement must be continuous, and the annual estimates must depend upon conditions as they arise.

The original estimated cost of the project was $50,000, and the principal work contemplated by it has been accomplished, but for reasons just stated the work can never be considered completed.

The amount expended under the project to June 30, 1899, is $61,827.10, of which sum $360.54 was expended during the past year in the care of plant.

Owing to the absence of funds, it was not possible to carry on any actual field work.

In the river and harbor act of March 3, 1899, the sum of $15,000 is appropriated for the continuation of this work. Preparations have been made for the active prosecution of the work as soon as the high water shall subside, but no actual operations in the field could be undertaken before the close of the fiscal year.

The work is under the direction of Capt. Hiram M. Chittenden, Corps of Engineers, secretary of the Commission, with Asst. Engineer F. B. Maltby in local charge.

The following paragraph relating to the importance and cost of future improvement, based upon a personal examination by the officer in charge of the work, is quoted from the last annual report of the Commission:

> It would appear that the commercial importance of this river will fully justify continuous improvement in the future. The same method of improvement recommended for the Osage is also recommended for this stream. The physical charteristics of both rivers are practically the same. Probably one lock could be built to advantage below Pryors Bend, where there is a long series of obstructions; but for the rest of the river the cheaper method of channel contraction will answer every purpose. It is estimated that the sum of $15,000 per year will maintain a satisfactory low-water navigable stage on this stream.

For further details, see report of Asst. Engineer F. B. Maltby, Appendix I.

For commercial statistics, see report of Asst. Engineer A. H. Blaisdell, Appendix O.

RECOMMENDATIONS AND ESTIMATES.

MISSOURI RIVER.

In previous reports the Commission has called attention to the inadequacy of the annual appropriations under recent acts to permit of satisfactory progress being made in the work of continuous improvement, especially as these acts have provided that large sums be diverted for improvements at widely detached localities.

It was urgently recommended that such localities be provided for by separate legislation, while the annual general appropriation should be used solely on the continuous improvement of the river by reaches, in accordance with the Congressional act of September, 1890.

Should this policy be pursued for a few years, the progress of the systematic work under more economical methods would soon become evident and commerce would begin to reap the benefit of the improvement.

There were nine detached localities at which work was directed to be done under the act of 1896, and this number was increased by the act of July 1, 1898, to thirteen and further increased to eighteen by acts of 1899.

There are localities lying in the first reach where the demands for improvement are most pressing, which would be reached in a short time could the systematic improvement be allowed to proceed unrestricted by diversion of funds to detached places.

The commission would also call attention to the depleted floating plant now available for its work.

During the last two seasons' operations the work was frequently embarrassed for the want of sufficient carriers to prosecute the work vigorously and cheaply.

This adjunct can not be hired at reasonable cost, but should be kept up if the work is to be continued on the river.

It does not appear possible to properly provide for the plant by proportional taxation of the allotments made for detached places, as that would leave the balances left for improvement purposes too small for any useful effect; but it was found necessary this year to thus provide for a small addition of new barges. With a more liberal appropriation for the general improvement, the plant could be gradually renewed and kept in condition at an expense which would not fall onerously on any of the works.

In 1883 a floating plant valued at $500,000 was available for carrying on the work of improving the Missouri River, and was adequate for the work involved in the expenditure of annual appropriations of $750,000.

Since 1883 another plant, valued at about $200,000, has been added, making total value, at first cost, $700,000. No plant has been added since 1894, and it has now deteriorated, through age, service, and lack of funds for renewal and proper repairs, to an exceedingly small value. It is entirely insufficient even for carrying on the small amount of work contemplated by the recent small appropriations, and in a short time will probably be practically reduced to nothing.

It is impracticable to carry on the work with any degree of efficiency for permanent useful results at the present rate of appropriations.

OSAGE RIVER.

Assuming that the work on the lock and dam will be completed during the present season, and that no further structures of this class will be required, the sum recommended for the improvement of the river under the original project is $25,000 per year.

GASCONADE RIVER.

The amount recommended for improvement under the existing project is $15,000 per year.

Money statements.

IMPROVING MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA.

July 1, 1898, balance unexpended	$320,874.19
Amount appropriated by urgent deficiency act approved January 5, 1899	100,000.00
Amount appropriated by river and harbor act approved March 3, 1899	100,000.00
Amount appropriated by sundry civil act approved March 3, 1899	200,000.00
Refunded on account of overpayments	3.10
	720,877.29
June 30, 1899, amount expended during fiscal year	317,174.78
July 1, 1899, balance unexpended	403,702.51
July 1, 1899, outstanding liabilities	32,835.06
July 1, 1899, balance available	370,867.45
Amount that can be profitably expended in fiscal year ending June 30, 1901	1,000,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

IMPROVING OSAGE RIVER, MISSOURI AND KANSAS.

July 1, 1898, balance unexpended	$4,108.71
Amount appropriated by river and harbor act approved March 3, 1899	25,000.00
	29,108.71
June 30, 1899, amount expended during fiscal year	2,875.89
July 1, 1899, balance unexpended	26,232.82
July 1, 1899, outstanding liabilities	1,273.09
July 1, 1899, balance available	24,959.73
Amount (estimated) required for completion of existing project:	
On lock and dam	146,000.00
On general improvement	[1]
Amount that can be profitably expended in fiscal year ending June 30, 1901, for works of improvement	171,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

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[1] Indeterminate.

IMPROVING GASCONADE RIVER, MISSOURI.

July 1, 1898, balance unexpended		$287.39
Amount appropriated by river and harbor act approved March 3, 1899		15,000.00
		15,287.39
June 30, 1899, amount expended during fiscal year		360.54
July 1, 1899, balance unexpended		14,926.85
July 1, 1899, outstanding liabilities		1,498.43
July 1, 1899, balance available		13,428.42
Amount that can be profitably expended in fiscal year ending June 30, 1901:		
For works of improvement	$14,000.00	
For maintenance of improvement	1,000.00	
		15,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Respectfully submitted.

Amos Stickney,
Lieutenant-Colonel of Engineers, U. S. A.
G. C. Broadhead.
Thos. H. Handbury,
Major, Corps of Engineers, U. S. A.
C. L. Chaffee.
W. L. Marshall,
Major, Corps of Engineers, U. S. A.

Brig. Gen. John M. Wilson,
Chief of Engineers, U. S. A.

Financial statement from July 1, 1898, to June 30, 1899.

Work.	Balances July 1, 1898.				Urgent deficiency appropriation act of Jan. 5, 1899.
	Appropriation act of Aug. 18, 1894.	Appropriation act of June 3, 1896.	Appropriation act of June 4, 1897.	Appropriation act of July 1, 1898.	
Improving Missouri River from mouth to Sioux City, Iowa.					
Office and traveling expenses and salaries of commission			$2,829.23	$20,000.00	
Surveys, gauges, physical data, and publications			2,842.47	10,500.00	
Systematic improvement, First Reach		$5,000.00	282.69		
First Reach				75,000.00	
Operating snag boat			813.88	20,000.00	
Rectification of the river at Omaha, Nebr.		146.77			
At Atchison, Kans	$1,195.82	890.99			
Opposite Leavenworth, Kans				5,000.00	
Vicinity of St. Joseph, Mo				30,000.00	
Mouth of Kaw River				5,000.00	
Above mouth Little Blue River				10,000.00	
Above Glasgow, Mo				15,000.00	
Near Huntsdale, Mo				10,000.00	
Pelican Bend and vicinity				50,000.00	$100,000.00
Local works above Kansas City, Mo			8,790.81		
Local works below Kansas City, Mo		70.88	2.35	30,000.00	
Repairs to works and contingencies				19,500.00	
Repairs and contingencies		8,503.86	4.49		
Total	1,195.82	9,612.50	10,065.87	300,000.00	100,000.00
Improving Osage River, Missouri and Kansas.					
Lock and dam (construction of lock, etc.)		2,824.03			
Snagging operations		1,284.68			
Total		4,108.71			
Improving Gasconade River, Missouri.					
Removal of snags and other obstructions		287.39			
Grand total	1,195.82	14,008.60	10,065.87	300,000.00	100,000.00

Financial statement from July 1, 1898, to June 30, 1899—Continued.

Work.	River and harbor appropriation act of Mar. 3, 1899.	Sundry civil appropriation act of Mar. 3, 1899.	Refunded on account of overpayment.	Total available.
Improving Missouri River from mouth to Sioux City, Iowa.				
Office and traveling expenses and salaries of commission	$9,000.00	$12,000.00	$0.25	$54,324.48
Surveys, gauges, physical data, and publications		10,500.00		23,842.47
Systematic improvement, First Reach				5,282.69
First Reach	13,500.00		2.03	88,502.03
Operating snag boat	25,000.00			45,813.83
Rectification of the river at Omaha, Nebr		40,000.00		40,146.77
At Atchison Kans				2,086.81
Opposite Leavenworth, Kans		3,000.00		7,000.00
Vicinity of St. Joseph, Mo		24,000.00		54,000.00
Mouth of Kaw River	1,000.00			6,000.00
Above mouth Little Blue River	5,000.00	10,000.00		25,000.00
Above Glasgow, Mo	10,000.00	8,000.00		23,000.00
Near Huntsdale, Mo	1,000.00			11,000.00
Pelican Bend and vicinity				150,000.00
Local works above Kansas City, Mo	16,000.00			19,790.81
Local works below Kansas City, Mo				30,078.23
Repairs to works and contingencies			.22	19,500.22
Repairs and contingencies	15,000.00	35,000.00	.60	53,508.95
At Randolph Bend, Mo		12,000.00		12,000.00
At Lexington, Mo		8,000.00		8,000.00
At Nigger Bend, Mo		8,000.00		8,000.00
At Jefferson City, Mo		16,000.00		16,000.00
New plant	4,500.00	13,500.00		18,000.00
Total	100,000.00	200,000.00	3.10	720,877.29
Improving Osage River, Missouri and Kansas.				
Lock and dam (construction of lock, etc.)	25,000.00			27,824.03
Snagging operations				1,284.68
Total	25,000.00			29,108.71
Improving Gasconade River, Missouri.				
Removal of snags and other obstructions	15,000.00			15,287.39
Grand total	140,000.00	200,000.00	3.10	765,273.39

Financial statement from July 1, 1898, to June 30, 1899—Continued.

Work.	Total amount expended to June 30, 1899.	Total balances June 30, 1899.	Outstanding liabilities June 30, 1899.	Balances available June 30, 1899.
Improving Missouri River from mouth to Sioux City, Iowa.				
Office and traveling expenses and salaries of commission	$19,926.77	$24,402.71	$691.96	$23,710.75
Surveys, gauges, physical data, and publications	12,041.81	11,800.66	840.00	10,960.66
Systematic improvement, First Reach	5,282.69			
First Reach	67,492.45	21,009.58	3,551.47	17,458.11
Operating snag boat	20,446.73	25,367.10	1,295.10	24,072.00
Rectification of the river at Omaha, Nebr	58.90	40,087.87	25.94	40,061.93
At Atchison, Kans		2,086.81	23.03	2,063.78
Opposite Leavenworth, Kans	4,843.01	2,156.99	45.00	2,111.99
Vicinity of St. Joseph, Mo	29,538.96	24,461.04		24,461.04
Mouth of Kaw River	4,785.84	1,214.16		1,214.16
Above mouth Little Blue River	8,794.30	16,205.70		16,205.70
Above Glasgow, Mo	19,670.08	13,329.92	2,504.19	10,825.73
Near Huntsdale, Mo	2,492.11	8,507.89	56.60	8,451.29
Pelican Bend and vicinity	49,993.47	100,006.53	4,124.47	95,882.06
Local works above Kansas City, Mo	2,817.30	16,973.51		16,973.51
Local works below Kansas City, Mo	30,073.23			
Repairs to works and contingencies	19,500.22			
Repairs and contingencies	18,483.18	35,025.77	8,645.46	26,380.31
At Randolph Bend, Mo		12,000.00		12,000.00
At Lexington, Mo		8,000.00		8,000.00
At Nigger Bend, Mo		8,000.00		8,000.00
At Jefferson City, Mo		16,000.00		16,000.00
New plant	933.73	17,066.27	11,031.84	6,034.43
Total	317,174.78	403,702.51	32,835.06	370,867.45
Improving Osage River, Missouri and Kansas.				
Lock and dam (construction of lock, etc.)	2,564.90	25,259.13	1,174.09	24,085.04
Snagging operations	310.99	973.69	99.00	874.69
Total	2,875.89	26,232.82	1,273.09	24,959.73
Improving Gasconade River, Missouri.				
Removal of snags and other obstructions	360.54	14,926.85	1,498.43	13,428.42
Grand total	320,411.21	444,862.18	35,606.58	409,255.60

Detailed statement July 5, 1884, to June 30, 1899.

Work.	Balance of appropriations of 1882.	Appropriations and allotments.	Refunded on account of overpayment, etc.	Total available.	Total expended to June 30, 1899.	Total balances June 30, 1899.	Outstanding liabilities June 30, 1899	Balance available June 30, 1899.
Survey of the Missouri River above the Missouri River Falls, Fort Benton, Mont	....	$15,000.00	....	$15,000.00	$15,000.00	....	....	....
Between Fort Benton, Mont., and Sioux City, Iowa.								
Office and inspection expenses of district officer	$2,000.00	4,749.00	....	6,749.00	6,749.00	....	....	....
Purchase and repair of plant	2,000.00	58,751.00	....	60,751.00	60,751.00	....	....	....
Work below Fort Benton	....	31,500.00	....	31,500.00	31,500.00	....	....	....
Improving Missouri River between Sioux City and Fort Benton	....	48,250.00	$0.75	48,250.75	48,250.75	....	....	....
Survey between Fort Benton and Sioux City	....	73,250.00	1.72	73,251.72	73,251.72	....	....	....
Office expenses and expenses of commission	....	5,000.00	53.24	5,053.24	5,053.24	....	....	....
Expenses proper of commission, gauges, and physical data	....	3,500.00	20.62	3,520.62	3,520.62	....	....	....
Total	4,000.00	225,000.00	76.33	229,076.33	229,076.33	....	....	....
Survey of Missouri River from its mouth to Fort Benton	8,844.39	....	....	8,844.39	8,844.39	....	....	....
Between Sioux City, Iowa, and the mouth of the river.								
Office and traveling expenses and salaries of commission	....	251,000.00	719.02	251,719.02	227,316.81	$24,402.71	$691.96	$23,710.75
Surveys, gauges, physical data, and publications	....	416,275.00	90.36	416,365.36	404,564.70	11,800.66	840.00	10,960.66
Expenses proper of commission, gauges, and physical data	....	33,800.00	188.97	33,988.97	33,988.97	....	....	....
Systematic improvement, First Reach	....	2,456,200.00	269.79	2,456,469.79	2,456,469.79	....	....	....
First Reach	....	88,500.00	2.03	88,502.03	67,492.45	21,009.58	3,551.47	17,458.11
Operating snag boat (removal of snags, etc.)	1,982.80	366,425.00	19.40	368,427.20	343,060.10	25,367.10	1,295.10	24,072.00
Construction, repair, and care of plant	....	458,864.84	12.75	458,877.59	441,811.32	17,066.27	11,031.84	6,034.43
Repairs to works and contingencies	....	80,500.00	.82	80,500.82	45,475.05	35,025.77	8,645.46	26,380.31
Omaha, Nebr., and Council Bluffs, Iowa	....	404,536.64	5.00	404,541.64	364,453.77	40,087.87	25.94	40,061.93
Nebraska City, and Nebraska City Island, Nebr	....	67,798.92	....	67,798.92	67,798.92	....	....	....
Rulo, Nebr	....	39,980.49	....	39,980.49	39,980.49	....	....	....
St. Joseph, Mo., and vicinity	....	529,769.98	14.87	529,784.85	505,323.81	24,461.04	....	24,461.04
Atchison, Kans	....	96,639.14	....	96,639.14	94,552.33	2,086.81	23.03	2,063.78
Leavenworth, Kans	....	115,713.71	....	115,713.71	113,456.72	2,156.99	45.00	2,111.99
Kansas City, Mo., and vicinity	....	674,501.96	72.58	674,574.54	673,360.38	1,214.16	....	1,214.16
Sioux City, Iowa	....	80,411.67	....	80,411.67	80,411.67	....	....	....
Arrow Rock, Mo	....	36,294.98	....	36,294.98	36,294.98	....	....	....
Miami, Mo	....	19,787.67	....	19,787.67	19,787.67	....	....	....

Detailed statement July 5, 1884, to June 30, 1899—Continued.

Work.	Balance of appropriations of 1882.	Appropriations and allotments.	Refunded on account of overpayment, etc.	Total available.	Total expended to June 30, 1899.	Total balances June 30, 1899.	Outstanding liabilities June 30, 1899.	Balance available June 30, 1899.
Between Sioux City, Iowa, and the mouth of the river—Continued.								
Local works above Kansas City, Mo		$51,000.00		$51,000.00	$34,026.49	$16,973.51		$16,973.51
Local works below Kansas City, Mo		392,000.00		392,000.00	209,949.96	182,050.04	$6,685.26	175,364.78
Total	$1,982.80	6,660,000.00	$1,395.59	6,663,378.39	6,259,675.88	403,702.51	32,835.06	370,867.45
Improving Osage River, Missouri and Kansas.								
Lock and dam (construction of lock, etc.)		196,855.18		196,855.18	171,596.05	25,259.13	1,174.09	24,085.04
Snagging operations		9,366.44		9,366.44	8,392.75	973.69	99.00	874.69
Examination of the stream		800.00		800.00	800.00			
Total		207,021.62		207,021.62	180,788.80	26,232.82	1,273.09	24,959.73
Improving Gasconade River, Missouri.								
Removal of snags and other obstructions		24,638.11		24,638.11	9,711.26	14,926.85	1,498.43	13,428.42
Examination of the stream from mouth to Arlington		500.00		500.00	500.00			
Total		25,138.11		25,138.11	10,211.26	14,926.85	1,498.43	13,428.42
Grand total	14,827.19	7,132,159.73	1,471.92	7,148,458.84	6,703,596.66	444,862.18	35,606.58	409,255.60

Consolidated statement, July 5, 1884, to June 30, 1899.

IMPROVING MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA.

Act of July 5, 1884		$640,000.00
Act of August 5, 1886		375,000.00
Act of August 11, 1888		1,000,000.00
Act of February 22, 1890		75,000.00
Act of September 19, 1890		800,000.00
Act of July 13, 1892		600,000.00
Act of March 3, 1893		700,000.00
Act of August 18, 1894		700,000.00
Act of March 2, 1895		710,000.00
Act of June 3, 1896		300,000.00
Act of June 4, 1897		300,000.00
Act of July 1, 1898		300,000.00
Act of January 5, 1899 (urgent deficiency)		100,000.00
Act of March 3, 1899 (river and harbor)		100,000.00
Act of March 3, 1899 (sundry civil)		200,000.00
Total specific appropriations		6,900,000.00
Balances from former appropriations:		
Act of August 2, 1882, applied to works above Sioux City, Iowa	$4,000.00	
Survey of Missouri River from mouth to Fort Benton	8,844.39	
Act of August 5, 1886, applied to removing obstructions from Missouri River	1,982.80	
Total balances		14,827.19
Received from sales and deposits		1,471.92
Total		6,916,299.11

IMPROVING OSAGE RIVER, MISSOURI AND KANSAS.

Act of August 18, 1894	$46,000.00	
Act of June 3, 1896	50,000.00	
Act of March 3, 1899	25,000.00	
Balances transferred January 15, 1895, from Maj. Charles J. Allen, Corps of Engineers:		
Act of September 19, 1890	42,655.18	
Act of July 13, 1892	43,366.44	
Total		207,021.62

IMPROVING GASCONADE RIVER, MISSOURI.

Act of August 18, 1894	$5,000.00	
Act of June 3, 1896	5,000.00	
Act of March 3, 1899	15,000.00	
Balance transferred January 15, 1895, from Maj. Charles J. Allen, Corps of Engineers, act of July 13, 1892	138.11	
Total		25,138.11
Grand total		7,148,458.84
Expended to June 30, 1899:		
For improving Missouri River	$6,512,596.60	
For improving Osage River	180,788.80	
For improving Gasconade River	10,211.26	
Total		6,703,596.66
Balance June 30, 1899		444,862.18

List of civilian engineers employed on work of river and harbor improvements in charge of Missouri River Commission from July 1, 1898, to June 30, 1899, inclusive, in connection with improving Missouri River from its mouth to Sioux City, Iowa (under acts of August 18, 1894, March 2, 1895, June 3, 1896, June 4, 1897, July 1, 1898, and March 3, 1899); improving Osage River, Missouri and Kansas (under river and harbor acts of June 3, 1896, and March 3, 1899); improving Gasconade River, Missouri (under river and harbor acts of June 3, 1896, and March 3, 1899).

Name and residence.	Time employed.		Compensation per month.	Where employed.
	Mos.	*ds.*		
Samuel H. Yonge, Nebraska City, Nebr	8	18	$250	Omaha division; local works above Kansas City.
S. Waters Fox, Jefferson City, Mo	8 8	18 12	250	Gasconade division; local works below Kansas City. Local works above and below Kansas City. Gasconade and Omaha divisions.
A. H. Blaisdell, St. Louis, Mo	12	0	250	St. Louis, Mo.
James A. Seddon, St. Louis, Mo	12	0	200	Do.
F. B. Maltby	1 1	18 0	200 250	Osage River; construction of lock and dam.
Samuel F. Crecelius, St. Louis, Mo	1 0	22 10	125	St. Louis, Mo. Improving Gasconade River; in field.
R. A. Crawford, Jefferson City, Mo	11 1	0 0	125 150	Gasconade division; local works below Kansas City.
W. R. De Witt, Jefferson City, Mo	11 1	0 0	125 150	Do.
Ed. Jones, Leavenworth, Kans	8 2 1	18 12 0	125 150	Do. Local works above Kansas City.
S. W. Benedict, Jefferson City, Mo	4 4	14 10	90 100	Gasconade division; local works below Kansas City.
O. H. B. Turner, St. Louis, Mo	0 6	15 25	100	St. Louis, Mo. Local works below Kansas City.

Abstract of proposals opened at St. Louis, Mo., May 6, 1899, for furnishing articles enumerated below in accordance with letter of April 4, 1899, from this office.

Articles.	Quantity.	J. V. Hoag, jr.		Jas. S. Pollard and Jos. D. Wallace.	
		Per unit.	Total.	Per unit.	Total.
Earth excavation (wet)...cubic yards	20,000	$2.30	$46,000.00	$0.80	$16,000.00
Earth excavation (dry)...do	5,000	2.30	11,500.00	.70	3,500.00
Rock excavation...do	800	2.30	1,840.00	1.00	800.00
Stone paving...square yards	800	3.00	2,400.00	1.40	1,120.00
Cement...barrels	6,000	3.50	21,000.00	2.95	17,700.00
Mortar (mixing, forming, and placing), cubic yards	150	3.00	450.00	5.00	750.00
Concrete (mixing, forming, and placing), cubic yards	5,500	3.00	16,500.00	4.50	24,750.00
Iron work (frames)...pounds	332,000	.11	36,520.00	.06½	21,580.00
Iron work (castings)...do	18,000	.07	1,260.00	.15	2,700.00
Piles...linear feet	30,000	.75	22,500.00	.50	15,000.00
Sheet piling (10 inches wide, per pile)...do	24,000	.75	18,000.00	.50	12,000.00
Lumber (floor and apron)...feet B. M	180,000	60.00	10,800.00	46.00	8,280.00
Lumber (sheathing)...feet B. M	110,000	60.00	6,600.00	63.00	6,930.00
Lumber (grillage)...feet B. M	135,000	60.00	8,100.00	37.00	4,995.00
Lock gates...number	4	2,119.75	8,479.00	a1,250.00	5,000.00
Removing old cofferdam...linear feet	680	9.00	6,120.00	b2.00	1,360.00
Total			218,069.00		142,465.00

a If built in place, add $1,000 for 4 lock gates.
b See letter transmitting proposals and abstract.

Amount available for payments under proposed contract, $171,000.

APPENDIX A.

ANNUAL REPORT ON SURVEYS, BY MR. A. H. BLAISDELL, ASSISTANT ENGINEER.

MISSOURI RIVER COMMISSION,
St. Louis, Mo., June 30, 1899.

CAPTAIN: I have the honor to report as follows on the work accomplished under the approved project of the topographical survey of the Missouri River Valley between the mouth and Sioux City, Iowa, during the fiscal year ending this day:

No survey party was sent into the field and the only work performed was the completion of the charts of the surveys of previous years.

These charts are fourteen in number, drawn to a scale of 1,000 feet to 1 inch, and embrace surveys made from 1894 to 1897, inclusive, covering the river from its mouth to 10 miles above Kansas City, Mo., a river distance of 400 miles.

The charts cover thoroughly all of the valley within 1¼ to 2 miles of the river, except where the bluffs lie nearer than those distances, and where the bluffs are farther away they have been separately located and platted. Contour lines on the low ground are shown at 5-feet intervals and on the bluffs at 20-feet intervals.

The total time of draftsmen employed was twenty-one months.

All of the earlier charts were critically gone over, omissions supplied and completed.

Tracings required for use in field and office were made and other incidental work was performed.

Very respectfully, your obedient servant,

A. H. BLAISDELL, *Assistant Engineer.*

Capt. H. M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary Missouri River Commission.

APPENDIX B.

ANNUAL REPORT ON GAUGES AND PHYSICAL DATA, BY MR. A. H. BLAISDELL, ASSISTANT ENGINEER.

OFFICE MISSOURI RIVER COMMISSION,
St. Louis, Mo., June 30, 1899.

CAPTAIN: I have the honor to submit the following report on water gauges during the fiscal year ending June 30, 1899.

There has been no change in the locations of the 22 permanent gauges maintained on the Missouri River from those given in last year's report.

One complete tour for inspection and repair made during October has sufficed to keep all the gauges in serviceable condition.

Of the 17 cable gauges on bridges, 2 have now in use the duplicate cords and weights with which these gauges are kept provided, and three have been furnished with new scale boards. A new inclined shore gauge was erected at Dewitt, a similar one reset at Waverly, and temporary ones, for low-water use, were reestablished at Lexington and Brownville.

The renewals and repairs have all been of an inexpensive character.

In addition to the regular gauges, 2 temporary ones maintained by the field parties are in the sixth year of their continuance.

The pilot-bulletin service, exhibiting the daily stages from practically the same zeros as the United States Weather Bureau, was continued throughout the year at Kansas City, Mo., and during eight months of navigable season at the 11 gauge stations below.

On application from steamboat men a bulletin frame was placed on each side of the Boonville Bridge, taking the place of a single frame on shore.

Abstracts of the weekly gauge reports have been mailed regularly to the snag boat and to the field officers, current hydrographs have been platted to date, and corrected hydrographs of the previous year have been nearly completed in ink.

Weekly reports of the upper river gauges during the months of their maintenance at Bismarck, N. Dak., Fort Benton, and Townsend, Mont., have been regularly received through the courtesy of the engineer officer in charge.

During the fall season the stage on the Missouri was about a mean of the preceding three years, broken, however, in the river below Dewitt by rises of about 4 to 5 feet and by smaller changes above. These rises occurred in September and October, and were the causes of a not very favorable season for the prosecution of improvement work.

The highest water of the year below Sioux City occurred during the last ten days in April, and in some localities was of the nature of a flood, reaching a stage higher than any since 1881, and only 3 feet below the flood of that year; in general, however, the stage varied from 0 to 1.5 feet above standard high water.

The "June rise" appears to have crested at Townsend, Mont., on June 23, being then 1.6 feet above standard high water, a stage equaling that of 1894, and the highest on record since 1892.

Below Sioux City the year ends with a stage varying from 2 to 6 feet below the April flood.

The 4 gauges on the Osage and the 1 on the Gasconade River were continued.

Although the fall stage on the Osage was considerably broken by irregular rises, the river at no time after July 13 reached a height which submerged the cofferdam at Lock No. 1.

The spring stages were as usual very fluctuating, but were not excessive in height.

The Gasconade hydrograph presents its usual sharp rises and falls and is only to be remarked for the low stage prevailing during the greater part of June of 1 foot and less above low water.

Very respectfully, your obedient servant,

A. H. Blaisdell, *Assistant Engineer.*

Capt. H. M. Chittenden,
Corps of Engineers, U. S. A.,
Secretary Missouri River Commission.

Appendix O.

ANNUAL REPORTS ON COMMERCIAL STATISTICS, BY MR. A. H. BLAISDELL, ASSISTANT ENGINEER.

Office Missouri River Commission,
St. Louis, Mo., June 30, 1899.

Captain: I have the honor to submit the following report on the commerce of the Missouri River between its mouth and the lower limits of Sioux City, Iowa, during the calendar year 1898.

The same method of procuring the statistics adopted in previous years—that of correspondence and personal inquiry—was followed.

In most cases the larger shippers willingly filled out the blank forms furnished them, but among the smaller shippers much correspondence usually ensued, followed frequently by personal investigation, before satisfactory returns were obtained.

The weekly reports on special commerce cards sent in by the water-gauge observers served as a check on the returns made by the shippers.

The tables giving the tonnage and measurements of steamers engaged in the trade are compiled from their inspection papers.

In some of the comparative tables previous to 1895, when the jurisdiction of the Missouri River Commission included Sioux City, Iowa, a small amount of the commerce reported should be credited to that port. Footnotes under the tables indicate the amount of such commerce.

Table 1, giving the amount of freight carried, towed, or rafted, and passengers carried in 1898, is a close approximation to the actual trade.

TABLE 1.

Class.	Grain.	Live stock.	Wood and lumber.	Sand and building materials.	Miscellaneous farm produce and general merchandise.	Total.	Mile-tons.	Passengers.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*		*No.*
Long-trade packets.	859.2	80.4	2,265.0	1.6	434.9	3,641.1	526,304.1	801
Short-trade packets and miscellaneous boats	14,559.0	4,346.4	10,426.0	5,161.0	4,752.7	39,245.1	522,871.7	79,102
Sand and wood steamers and barges	....	....	1,876.6	250,275.0	....	252,151.6	359,948.5	....
Rafts	....	....	5,754.8	....	....	5,754.8	145,436.7	....
Mattress brush furnished and towed under contract for United States improvement of Mississippi River	....	....	19,000.0	....	....	19,000.0	875,000.0	....
Total	15,418.2	4,426.8	39,322.4	255,437.6	5,187.6	319,792.6	1,929,561.0	[a]79,903

[a] Including 76,100 excursion passengers.

During the year 1898 the harbor and wharf commissioner of St. Louis, Mo., reported the total arrivals from the Missouri River at the city wharf as 11 packets, 12 boats, and 12 barges.

The eleven packet trips were made by the steamer *Peerless* and barge; her trips extended up to Wolf Point, 183 miles, carrying grain, country produce, merchandise, and lumber.

The steamer *Gasconade* made two trips to St. Louis and eight trips between Jefferson City and Sunshine Landing, 182 miles; her loads were principally native lumber.

The freights of these two steamers constitute the long-trade packet business given in Table 1.

The short-packet trade was carried on by small steamers and barges which, in addition to a regular local trade, run as feeders to the railroads during the grain season.

The projected enterprise of the Leavenworth Coal Company, to deliver coal from their mines in Leavenworth by transfer steamer to Kansas City was inaugurated; quite extensive coal chutes, inclines, and storage sheds were built, and four trips were made with the boat during the year.

Some steamers as large as 160 feet in length by 32 feet beam and smaller ones towing barges have found it profitable to engage in the excursion trade on the river.

The *Jacob Richtman*, having dimensions above quoted, at Omaha, carried 75,000 excursion passengers while the Trans-Mississippi Exposition was in progress, and is again in the river the present year engaged in the same line of trade at Kansas City.

The following comparative table gives the totals for the different classes of trade for the series of years 1893–1898:

TABLE 2.

Class.	Total number of tons carried.					
	1898.	1897.	1896.	1895.	1894.	1893.
Long-trade packets	3,641	4,499	3,168	7,779	3,622	19,311
Short-trade packets and miscellaneous boats	39,245	40,476	52,796	46,449	46,829	73,248
Sand and wood steamers and barges	252,152	341,710	229,619	175,453	95,573	146,828
Rafts	5,755	4,344	3,148	2,984	3,310	10,578
Mattress brush furnished and towed under contract for United States improvement of Mississippi River	19,000	....	136	22,500	....	....
Mattress brush furnished and towed under contract for United States improvement of Missouri River above the southern limits of Sioux City, Iowa	....	....	67	....	....	....
Total	319,793	391,029	288,934	255,165	154,334	249,965

Class.	Mile-tons.					
	1898.	1897.	1896.	1895.	1894.	1893.
Long-trade packets	526,304	651,024	443,614	1,010,379	1,045,526	4,093,147
Short-trade packets and miscellaneous boats	522,872	447,433	1,064,568	965,536	729,862	758,605
Sand and wood steamers and barges	359,948	473,459	281,205	240,988	156,346	235,998
Rafts	145,437	164,569	45,395	76,655	141,850	579,215
Mattress brush furnished and towed under contract for United States improvement of Mississippi River	375,000	....	3,798	675,000	....	....
Mattress brush furnished and towed under contract for United States improvement of Missouri River above the southern limits of Sioux City, Iowa	....	....	1,051	....	....	....
Total	1,929,561	1,736,485	1,839,631	2,968,558	2,073,584	5,666,965

Class.	Passengers.					
	1898.	1897.	1896.	1895.	1894.	1893.
Long-trade packets	801	109	375	1,175	3,150	3,700
Short-trade packets and miscellaneous boats	[a] 79,102	2,541	1,538	5,373	[b] 3,312	[c] 8,532
Total	79,903	2,650	1,913	6,548	6,462	12,232

[a] Including 76,100 excursion passengers.
[b] Including 1,000 excursion passengers, 533 of which were above southern limits of Sioux City, Iowa.
[c] Including 6,200 excursion passengers.

Table 3 gives the number and total registered tonnage of steamboats engaged in trade on the Missouri River for the years 1890–1898:

TABLE 3.

Enrolled at—	1898.		1897.		1896.		1895.		1894.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
St. Louis, Mo	21	2,013.72	21	1,551.52	21	1,970.05	21	1,902.15	17	1,445.54
Kansas City, Mo	11	1,980.51	11	574.67	7	484.20	8	600.03	7	582.60
St. Joseph, Mo	1	27.08	2	31.08	3	47.50	3	47.50	3	47.50
Omaha, Nebr	a 9	323.66	b 9	450.66	b 8	447.68	c 8	447.68	d 12	836.72
Burlington, Iowa							2	443.85	1	348.49
La Crosse, Wis							2	359.45		
Nashville, Tenn									1	172.78
Rock Island, Ill	1	222.00							1	188.99
St. Paul, Minn							1	106.64		
Total	43	4,566.97	43	2,607.93	39	2,949.43	45	3,907.30	42	3,622.62

Enrolled at—	1893.		1892.		1891.		1890.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
St. Louis, Mo	20	2,282.49	24	2,562.78	19	2,504.31	18	1,840.61
Kansas City, Mo	11	2,932.42	12	2,980.08	18	3,398.13	17	1,270.33
St. Joseph, Mo	3	47.50	3	148.88	5	265.41	5	277.62
Omaha, Nebr	11	911.99	11	912.29	12	794.21	10	504.72
Burlington, Iowa	2	450.84						
Dubuque, Iowa	1	58.32	1	58.32				
Cincinnati, Ohio	1	134.92						
St. Paul, Minn			1	324.09				
Louisville, Ky							1	1,130.34
New Orleans, La			1	358.31				
Total	49	6,818.48	53	7,344.75	54	6,962.06	51	5,023.62

a Seven of these did not go below the southern limits of Sioux City, Iowa.
b Five of these did not go below the southern limits of Sioux City, Iowa.
c Six of these did not go below the southern limits of Sioux City, Iowa.
d Ten of these did not go below the southern limits of Sioux City, Iowa.

Four gasoline boats on the river, engaged in short trade, carried an aggregate of 7,732 tons (109,472 ton-miles) during the year.

The number of boats passing six of the gauge stations is given in the following table:

TABLE 4.

Locality.	Number steamers passed.		Registered tonnage.	
	Up.	Down.	Up.	Down.
Bellefontaine Bridge, Mo	93	93	8,183.05	6,786.04
Coles Creek, Mo	189	189	9,940.23	8,505.12
Jefferson City, Mo	85	83	5,723.61	4,029.39
Boonville, Mo	104	103	6,694.56	5,040.86
Lexington, Mo	17	15	3,703.78	2,024.08
Omaha, Nebr	6	6	1,153.82	1,153.82

TABLE 5.—*List of steamers plying on the Missouri River in the district of New Orleans, enrolled at the port of St. Louis, Mo., during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions.			Total tonnage.
				Length.	Breadth.	Depth.	
				Feet.	*Feet.*	*Feet.*	*Tons.*
A. W. Ewing	Osage City, Mo	1878	May 5, 1898	......	......	......	*a* 4.00
Bee	St. Joseph, Mo	1893	May 5, 1897	53.5	13.5	3.5	16.42
C. H. Hugo	New Haven, Mo	1897	Aug. 8, 1898	79.2	18.2	3.3	38.22
Columbia	Osage City, Mo	1898	May 13, 1898	80.5	18.8	3.8	73.62
Commodore	New Haven, Mo	1890	July 6, 1898	97.0	23.2	3.2	86.45
Dauntless	Tuscumbia, Mo	1898	June 10, 1898	59.3	11.9	3.1	26.97
Dolphin	Jeffersonville, Ind	1873	May 16, 1898	135.8	22.8	4.8	156.16
Eillen	Woodville, Wis	1892	June 2, 1898	81.5	15.0	3.0	25.36
Fawn	Hermann, Mo	1880	April 28, 1898	91.9	19.1	3.4	73.00
Frederick	Tuscumbia, Mo	1883	May 5, 1898	96.4	14.3	3.0	82.51
Gasconade	Hermann, Mo	1891	May 6, 1898	107.4	23.9	3.5	74.35
J. R. Wells	Tuscumbia, Mo	1898	April 2 1898	110.6	20.6	4.0	206.98
J. W. Spencer	Jeffersonville, Ind	1892	July 5, 1898	131.0	35.0	5.0	188.59
Jack Rabbit	Mount Sterling, Mo	1896	July 7, 1898	73.6	16.2	3.3	32.47
Jacob Richtman	Sterling Island, Mo	1898	June 2, 1898	160.0	32.0	5.0	460.42
Jennie Gilchrist	Leclaire, Iowa	1877	Aug. 3, 1898	100.5	18.5	3.8	74.48
John R. Hugo	Evansville, Ind	1879	June 14, 1898	127.0	20.0	3.0	136.88
Millboy	Hermann, Mo	1893	Feb. 18, 1898	89.2	18.8	2.8	41.10
Peerless	....do	1894	....do	96.6	21.4	3.5	60.41
Thomas Parker	St. Louis, Mo	1894	Mar. 30, 1898	100.0	18.1	4.5	57.83
Wildwood	Rock Island, Ill	1894	Mar. 8, 1898	99.5	20.3	4.0	78.50

Name.	Staterooms.	Berths.	Passengers.			Engines.			Boilers.				
												Flues.	
			Permitted to carry.	First cabin.	Steerage or deck.	Number.	Diameter.	Stroke.	Number.	Length.	Diameter.	Number.	Diameter.
							In.	*Feet.*		*Feet.*	*Inches.*		*Inches.*
A. W. Ewing	....	....	8	......	8	1	6	$\frac{8}{12}$	1	3	40	*b* 70	1½
Bee	....	....	....	......	......	1	8	1	1	11$\frac{10}{12}$	34	*b* 28	3
C. H. Hugo	....	....	20	......	20	2	7	3	1	13½	50	1 2 *b* 24	28 4 3
Columbia	....	....	10	......	10	2	7½	2½	1	11½	34	*b* 26	3
Commodore	....	....	50	......	50	2	10	4	1	20	44	6	2–12 4– 6
Dauntless	....	....	19	......	19	2	5½	2	1	5	48 x 54	*b* 24	1½
Dolphin	....	....	....	......	......	2	16	4½	2	26	44	6	2–12 4– 7
Eillen	....	....	10	......	10	2	7½	4	1	16	40	9	6
Fawn	....	....	50	......	50	2	8	2	1	14	42	4	2–10 2–12
Frederick	4	13	28	13	15	2	7	2½	1	14	36	6	6
Gasconade	3	6	35	5	30	2	9	3½	1	20	42	6	2–10 4– 6
J. R. Wells	5	10	20	10	10	2	10	4	1	18	44	10	6
J. W. Spencer	....	....	....	......	......	2	16	6	2	26	40	......	......
Jack Rabbit	....	....	20	......	20	2	6	2	1	10	36	*b* 14	9– 3 5– 3½
Jacob Richtman	13	26	126	26	100	2	14	6	2	22½	44	*b* 34	3½
Jennie Gilchrist	....	....	....	......	......	2	12	3	2	20	31	5	6
John R. Hugo	6	10	25	9	16	2	12½	3½	1	24	42	5	10
Millboy	....	....	20	......	20	2	8	1	1	14	44	1 *b* 26	24 3
Peerless	2	4	22	......	22	2	8	3	1	16	42	2 *b* 36	15 3
Thomas Parker	5	10	20	5	15	2	10	6	1	20	46	6	2–13 4– 7
Wildwood	....	....	....	......	......	2	11	4	1	20	42	10	6

a Estimated. *b* Tubes.

TABLE 5.—*List of steamers plying on the Missouri River, in the district of New Orleans, enrolled at the port of St. Louis., Mo., during the year 1898*—Continued.

Name.	Boilers.			Licensed to run on—	Name and address of sole or managing owner.
	Iron or steel.	When built.	Steam pressure allowed.		
			Lbs.		
A. W. Ewing	Steel	1885	125	Mississippi and tributary rivers.	E. R. Son, Osage City, Mo.
Bee	do	1867	112	Missouri and tributary rivers.	E. W. Wild, Wilton, Mo.
C. H. Hugo	do	1897	146	Mississippi and tributary rivers.	Frank L. Blaske, Washington, Mo.
Columbia	do	1887	112	do	E. W. Wild, Wilton, Mo.
Commodore	do	1890	153	do	D. N. Burruss, Miami, Mo.
Dauntless	Iron	1898	225	do	Frank Maylee, Tuscumbia, Mo.
Dolphin	Steel	1882	140	do	Cape Girardeau Transportation Co., St. Louis, Mo.
Eillen	do	1892	168	do	Jas. J. Richtman, Elsberry, Mo.
Fawn	Iron	1877	110	do	J. H. Buglar, St. Charles, Mo.
Frederick	do	1883	150	do	M. W. Grant, Osage City, Mo.
Gasconade	Steel	1891	160	do	Hermann Ferry and Packet Co., Hermann, Mo.
J. R. Wells	do	1898	177	do	Anchor Milling Co., Tuscumbia, Mo.
J. W. Spencer	do	1882	150	Missouri River, 5 miles above and below St. Joseph, Mo.	Alex. Stewart, St. Joseph, Mo.
Jack Rabbit	do	1889	130	Mississippi and tributary rivers.	Hermann Ferry and Packet Co., Hermann, Mo.
Jacob Richtman	do	1898	188	do	Jacob Richtman, Elsberry, Mo.
Jennie Gilchrist	do	1879	140	do	T. T. Lewis, St. Louis, Mo.
John R. Hugo	do	1894	160	do	M. W. Grant, Osage City, Mo.
Millboy	do	1893	110	do	Hermann Ferry and Packet Co., Hermann, Mo.
Peerless	do	1893	160	do	Do.
Thomas Parker	do	1897	146	do	Thomas Parker, St. Louis, Mo
Wildwood	do	1881	166	do	Joe. Short, St. Charles, Mo.

TABLE 6.—*List of steamers plying on the Missouri River, in the district of New Orleans, enrolled at the port of Kansas City, Mo., during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions.			Total tonnage.
				Length.	Breadth.	Depth.	
				Feet.	*Feet.*	*Feet.*	*Tons.*
Annie Cade	Leavenworth, Kans	1879	May 5, 1898	127.5	32	4.5	178.32
Ariel	Lexington, Mo	1897	July 5, 1898	84.6	21	3.8	53.82
Carrie Cole	Chicago, Ill	1887	Oct. 11, 1898				a 3.00
Geo. W. Parker	Pittsburg, Pa	1879	do	266	46.5	7	1,491.11
Guy Hunter	Arrow Rock, Mo	1898	July 7, 1898	94.7	18.9	3.9	56
Joe. L. Stevens	Jeffersonville, Ind	1887	May 17, 1898	103	29.4	4.2	85.96
Laura	Arrow Rock, Mo	1895	Aug. 11, 1898	83.3	16.4	2.6	38.10
Lois	Waverly, Mo	1896	Oct. 12, 1898	75.2	18.9	3.1	35.29
Nadine	Lamine, Mo	1892	July 7, 1898	75.3	15.1	3	27.89
Navajo	Kansas City, Mo	1897	Oct. 11, 1898	38.5	4.6	2.3	b 5.76
Ranger	Papinsville, Mo	1898	May 4, 1898	36.2	8.9	2.3	5.27

a Estimated.

b Has double hull of dimensions given.

TABLE 6.—*List of steamers plying on the Missouri River, in the district of New Orleans, enrolled at the port of Kansas City, Mo., during the year 1898*—Continued.

Name.	Staterooms.	Berths.	Passengers. Permitted to carry.	Passengers. First cabin.	Passengers. Steerage or deck.	Engines. Number.	Engines. Diameter.	Engines. Stroke.	Boilers. Number.	Boilers. Length.	Boilers. Diameter.	Boilers. Flues. Number.	Boilers. Flues. Diameter.
							In.	*Feet.*		*Feet.*	*Inches.*		*Inches.*
Annie Cade	.....	.....	.....	.....	.....	1	20½	5½	2	16	42	.....	.....
Ariel	.....	.....	.....	.....	.....	2	9	3	1	18	42	.....	.....
Carrie Cole	.....	.....	16	.....	16	1	4½	$\frac{7}{12}$	1	4$\frac{11}{12}$	30	*a* 37	2
Geo. W. Parker	.....	.....	.....	.....	.....	2	22	7	4	26	42	2	15
Guy Hunter	.....	.....	25	.....	25	2	10	2½	1	16	44	10	6
Joe. L. Stevens	.....	.....	.....	.....	.....	2	10	3½	1	16	48	.....	.....
Laura	.....	.....	25	.....	25	2	7	3	1	12	40	7	6
Lois	.....	.....	21	.....	21	2	7	2½	1	12	40	*a* 34	3
Nadine	.....	.....	20	.....	20	2	8	2	1	14	40	*a* 40	3
Navajo	.....	.....	25	.....	25	2	4½	½	1	4	60 x 39	*a* 15	1
Ranger	.....	.....	.....	.....	.....	1	6	$\frac{5}{12}$	1	4½	42	*a* 52	2

Name.	Boilers. Iron or steel.	Boilers. When built.	Boilers. Steam pressure allowed.	Licensed to run on—	Name and address of sole or managing owner.
			Lbs.		
Annie Cade	Iron	1879	119	Missouri River, 5 miles above and below Kansas City.	W. A. Cade, Kansas City, Mo.
Ariel	Steel	1887	160	Missouri River, Lexington, Mo., and opposite shore.	Lexington Ferry, Coal and Transportation Co., Lexington, Mo.
Carrie Cole	do	1898	180	Mississippi and tributary rivers.	Geo. W. Westfall, Kansas City, Mo.
Geo. W. Parker	Iron	1879	136	Missouri River, Kansas City, Mo., to St. Joseph, Mo.	Leavenworth Coal Co., Leavenworth, Kans.
Guy Hunter	Steel	1898	180	Mississippi and tributary rivers.	L. E. Moehle, Arrow Rock, Mo.
Joe. L. Stevens	do	1887	125	Missouri River, Boonville, Mo., and opposite shore.	Mary E. Brent, Boonville, Mo.
Laura	do	1891	150	Mississippi and tributary rivers.	O. S. Vaughn, Ste. Genevieve, Mo.
Lois	do	1896	110	Missouri River, 30 miles above and below Waverly, Mo.	J. D. Thomas, Waverly, Mo.
Nadine	do	1889	130	Mississippi and tributary rivers.	D. N. Smith, Boonville, Mo.
Navajo	Iron	1897	145	Missouri and tributary rivers, 385 miles.	Winthrop Allen, Kansas City, Mo.
Ranger	Steel	1897	80	Osage and tributary rivers, 500 miles.	W. B. Carrico, Papinsville, Mo.

a Tubes.

TABLE 7.—*List of steamers plying on the Missouri River, in the district of New Orleans, enrolled at the port of St. Joseph, Mo., during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions.			Total tonnage.
				Length.	Breadth.	Depth.	
				Feet.	*Feet.*	*Feet.*	*Tons.*
Harry Lynds	White Cloud, Kans	1892	Apr. 6, 1898	64	18	3	27.66

Name.	Staterooms.	Berths.	Passengers.			Engines.			Boilers.				
			Permitted to carry.	First cabin.	Steerage or deck.	Number.	Diameter.	Stroke.	Number.	Length.	Diameter.	Flues.	
												Number.	Diameter.
							In.	*Feet.*		*Feet.*	*Inches.*		*Inches.*
Harry Lynds	....	....	20	......	20	1	7	$\frac{10}{12}$	1	7	30	1 a 13	12 3

Name.	Boilers.			Licensed to run on—	Name and address of sole or managing owner.
	Iron or steel.	When built.	Steam pressure allowed.		
			Lbs.		
Harry Lynds	Steel	1895	160	Missouri River 50 miles above and below White Cloud, Kans.	J. H. Lynds, White Cloud, Kans.

a Tubes.

TABLE 8.—*List of steamers plying on the Missouri River, in the district of New Orleans, enrolled at the port of Omaha, Nebr., during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions. Length.	Dimensions. Breadth.	Dimensions. Depth.	Total tonnage.
				Feet.	*Feet.*	*Feet.*	*Tons.*
Capitola Butt *a*	Montrose, Iowa	1885	Aug. 28, 1897	83.7	23.3	3.3	57.31
Castalia *a*	Sioux City, Iowa	1892	June 30, 1898	110.0	26.2	3.7	90.06
Josie L. K. *a*	Chamberlain, S. Dak	1896	May 16, 1898	60	14	2.5	22.45
Last Chance *a*	Burlington, Iowa	1870	May 17, 1898	98	17	3	50.47
Little Maud *a*	Sioux City, Iowa	1882	do	92	20	3.4	58.66
Mary E. Bennett	Covington, Nebr	1888	Sept. 1, 1898	65	14	2.5	21.71
Minnehaha *a*	Canton, S. Dak	1893	June 15, 1898				*b* 8
Queen, No. 2	Tieville, Iowa	1879	do	44	12	2	12
Mella *a*	Camden, N. J	1893	June 14, 1897				*b* 3

Name.	Staterooms.	Berths.	Passengers. Permitted to carry.	Passengers. First cabin.	Passengers. Steerage or deck.	Engines. Number.	Engines. Diameter.	Engines. Stroke.	Boilers. Number.	Boilers. Length.	Boilers. Diameter.	Boilers. Flues. Number.	Boilers. Flues. Diameter.
							In.	*Ft.*		*Feet.*	*Inches.*		*Inches.*
Capitola Butt *a*			20		20	2	11	3½	1	20	46	10	7
Castalia *a*	6	12	22	7	15	2	10	4	1	20	42	6	2-10 4-6
Josie L. K. *a*			30		30	2	6	1	1	6½	42	*c* 52	2½
Last Chance *a*			12		12	2	11	3	1	18	42	8	6
Little Maud *a*						2	10½	3	1	24	40		
Mary E. Bennett						2	7½	$2\frac{1}{12}$	1	16	38	5	8
Minnehaha *a*			40		40	1	4	$\frac{5}{12}$	1	6	24	*c* 31	2
Queen, No. 2						1	8	$\frac{10}{12}$	1	8	36		
Mella *a*			12		12	1	2½x4½	$3\frac{1}{12}$	1	$3\frac{5}{12}$			

Name.	Boilers. Iron or steel.	Boilers. When built.	Boilers. Steam pressure allowed.	Licensed to run on—	Name and address of sole or managing owner.
			Lbs.		
Capitola Butt *a*	Steel	1885	130	Missouri and tributary rivers.	J. W. Sanford, Sioux City, Iowa.
Castalia *a*	do	1892	160	Mississippi and tributary rivers.	B. H. Holmes, Sioux City, Iowa.
Josie L. K. *a*	do	1888	120	Missouri and tributary rivers.	Yankton Ferry Co., Yankton, S. Dak.
Last Chance *a*	do	1897	160	Mississippi and tributary rivers.	H. J. King, Chamberlain, S. Dak.
Little Maud *a*	do	1889	150	Missouri River, Running Water to Fort Randall, S. Dak.	Jos. F. Leach, Running Water, S. Dak.
Mary E. Bennett	do	1891	150	Mississippi and tributary rivers.	W. F. Parker, Omaha, Nebr.
Minnehaha *a*	do	1894	140	Missouri and tributary rivers, 100 miles.	J. W. Clairidge, Sioux City, Iowa.
Queen, No. 2	do	1898	150	Missouri River, Decatur, Nebr., and opposite shore.	Anderson & Kilbourn, Decatur, Nebr.
Mella *a*	Copper	1893	150	Missouri and tributary rivers.	Selzer Bros., Sioux City, Iowa.

a Did not go below the southern limits of Sioux City, Iowa. *b* Estimated. *c* Tubes.

TABLE 9.—*List of steamers plying on the Missouri River in the district of New Orleans, enrolled at the port of Rock Island, Ill., during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions. Length.	Dimensions. Breadth.	Dimensions. Depth.	Total tonnage.
				Feet.	*Feet.*	*Feet.*	*Tons.*
Columbia	Clinton, Iowa	1897	July 25, 1898	166.5	33.6	5	222.08

Name.	State rooms.	Berths.	Passengers. Permitted to carry.	Passengers. First cabin.	Passengers. Steerage or deck.	Engines. Number.	Engines. Diameter.	Engines. Stroke.	Boilers. Number.	Boilers. Length.	Boilers. Diameter.	Boilers. Flues. Number.	Boilers. Flues. Diameter.
							In.	*Feet.*		*Feet.*	*Inches.*		*Inches.*
Columbia	24	47	150	45	105	2	14½	6	2	24	48	[a]36	4

Name.	Boilers. Iron or steel.	Boilers. When built.	Boilers. Steam pressure allowed.	Licensed to run on—	Name and address of sole or managing owner.
			Lbs.		
Columbia	Steel....	1897	270	Mississippi and tributary rivers.	W. J. Young & Co., Clinton, Iowa.

[a] Tubes.

TABLE 10.—*List of gasoline boats plying on the Missouri River between the mouth and Sioux City, Iowa, during the year 1898.*

Name.	Where built.	Year.	Date of last inspection.	Dimensions. Length.	Dimensions. Breadth.	Dimensions. Depth.	Total tonnage.
				Feet.	*Feet.*	*Feet.*	*Tons.*
Ada	Plattsmouth, Nebr	1894	June 14, 1898	74	12.5	2.4	21.44
Ada, Queen of the West.	Brownville, Nebr.........	1894	Apr. 7, 1898	55	16.1	3	26.21
Hermann	Hermann, Mo	1892	Apr. 18, 1898	73.7	12.8	3	23.40
L. B. + ...	Jefferson City, Mo........	1896	....	63.2	10.3	3.2	13.32
Liberty	Randolph, Mo	1894	May 5, 1898	79.3	18	3.2	39.94
Little Sam.........	Rocheport, Mo	1896	....	60	13	2.5	13.53
Minna	Arrow Rock, Mo	1891	....	....	....	....	[a]10
Romana	Osage City, Mo...........	1892	Apr. 18, 1898	54.6	11	3.2	15.44
Sadie G............	Kansas City, Mo	1895	....	....	....	....	[a]10
W. J. Bryan	Bellevue, Nebr	1896	Apr. 8, 1898	....	....	....	28.50

[a] Estimated.

TABLE 10.—*List of gasoline boats plying on the Missouri River between the mouth and Sioux City, Iowa, during the year 1898*—Continued.

Name.	Licensed to run on—	Name and address of sole or managing owner.
Ada	Missouri and tributary rivers	W. F. Parker, Omaha, Nebr.
Ada, Queen of the West.	Missouri River, 5 miles above and below Brownville, Nebr.	A. Z. Martin, Brownville, Nebr.
Hermann	Missouri and tributary rivers	Hugo Kropp, Hermann, Mo.
L. B. +		Henry Strutmann, Jefferson City, Mo.
Liberty	Missouri River, 3 miles above and below Randolph, Mo.	E. J. Held, Thornton, Mo.
Little Sam		J. T. Toomes, St. Charles, Mo.
Minna		L. H. Friemouth, Glasgow, Mo.
Romana	Osage River, 7 miles above and below Lisletown, Mo.	Wm. L. Hulser, Lisletown, Mo.
Sadie G.		W. E. Garrett, Independence, Mo.
W. J. Bryan	Missouri River, 5 miles above and below Bellevue, Nebr.	Bellevue Transfer Co., Bellevue, Nebr.

Very respectfully, your obedient servant,

A. H. BLAISDELL,
Assistant Engineer.

Capt. H. M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary Missouri River Commission.

OFFICE MISSOURI RIVER COMMISSION,
St. Louis, Mo., June 30, 1899.

CAPTAIN: I have the honor to submit the following report on the commerce of the Osage River during the calendar year 1898:

The weekly reports of the observers of the four permanent water gauges on special commerce cards and the checking of the shipments made by rail at the three railroad towns on the river afforded a means of verifying the returns received from shippers and rafters through correspondence.

The larger part of the steamboat traffic was performed by the steamers *Frederick* and *J. R. Wells*, both of which were built especially for the river. Taking both boats together, 122 trips were made, of which 33 were to Tuscumbia, 60 miles, and 6 to Linn Creek, 109 miles.

A Missouri River gasoline boat L. B. + made 5 trips, one of which was to Linn Creek.

The small steamer *Dauntless* made regular trips between Tuscumbia and Linn Creek during the boating season, and the little steamer *Ranger* ran between Osceola, 228.5 miles, and Papinsville, 282.7 miles above the mouth.

Two gasoline boats on the lower river carried 70 tons during the year.

The *Frederick's* freight was mostly delivered to the Missouri Pacific Railroad at the mouth of the river, and that of the *Wells* to the Missouri, Kansas and Texas Railroad at Portland, on the left bank of the Missouri River.

The following table, giving the amount of freight carried, towed, and rafted, is a close approximation to the amount of the 1898 commerce:

TABLE 1.

Class.	Grain.	Live stock.	Wood and lumber.	Railroad ties.	Sand and gravel.	Salt.	Produce.	Farm machinery and general merchandise.	Total.	Mile-tons.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Packets and miscellaneous boats	3,418.3	1,038.2	627.4		3,015	348	201.2	1,384.6	10,032.7	349,954.6
Rafts			1,040.4	73,213.3					74,253.7	3,825,099.8
Total	3,418.3	1,038.2	1,667.8	73,213.3	3,015	348	201.2	1,384.6	84,286.4	4,175,053.9

Table 2 is a comparative statement of the commerce of the river, expressed in tons, for the series of years 1890–1898:

TABLE 2.

Articles.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Hay, grain, etc	3,418	1,598	2,651	4,496	4,793	3,773	5,471	6,135	5,118
Live stock	1,038	909	843	1,366	1,076	741	739	957	766
Lumber, logs, wood, and railroad ties	74,881	66,175	62,764	64,986	89,086	62,020	69,721	77,195	86,349
Sand and gravel	3,015	1,350	4,500	3,600	8,100	....	....	....	....
Salt	348	229	416	328	128	329	281	602	482
Produce	201	255	188	191	186	196	182	527	319
Farm machinery and general merchandise	1,385	731	1,031	1,739	1,416	946	1,686	2,858	2,269
Barytes	....	....	....	....	440	470	1,200	2,775	1,710
Total	84,286	71,247	72,393	76,706	105,225	68,475	79,280	91,049	97,013

Table 3 gives the comparative commerce expressed in mile-tons during the series of years 1894-1898, this data only having been secured since the river was placed in charge of the commission.

TABLE 3.

Class.	1898.	1897.	1896.	1895.	1894.
	Mile-tons.	*Mile-tons.*	*Mile-tons.*	*Mile-tons.*	*Mile-tons.*
Packets and miscellaneous boats	349,955	178,695	212,398	263,554	361,292
Rafts	3,825,099	3,707,200	3,839,483	2,941,509	4,169,429
Total	4,175,054	3,885,895	4,051,881	3,205,063	4,530,721

These tables show a satisfactory increase in the 1898 trade of the river over the three preceding years.

Very respectfully, your obedient servant,

A. H. BLAISDELL,
Assistant Engineer.

Capt. H. M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary, Missouri River Commission.

OFFICE MISSOURI RIVER COMMISSION,
St. Louis, Mo., June 30, 1899.

CAPTAIN: I have the honor to submit the following report on the commerce of the Gasconade River during the calendar year 1898:

The statistics were obtained by correspondence and by personal inspection of the freight books of the shippers.

The steamboat trade was principally carried on the steamers *Jack Rabbit* and the *Peerless*, the former making 45 trips and the latter 21.

The steamboat traffic was mostly over the lower 53 miles of the river, only 9 per cent of the shipments being above that point. Vienna, 79 miles above the mouth, was the limit of the steamboat trade.

The average distance that the lumber and railroad ties were rafted was 62 miles.

The extreme rafting point was 97 miles up Big Piney Creek, which enters the Gasconade 122 miles above its mouth.

The following table gives a close approximate to the amount of the 1898 commerce:

TABLE 1.

Class.	Grain.	Live stock.	Wood and lumber.	Railroad ties.	Building material.	Sand and gravel.	Salt.	Produce.	Farm machinery and general merchandise.	Total.	Mile-tons.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Packets and miscellaneous boats	1,667.2	708.2	1,790.2	....	156.7	162.7	57.4	223.3	872.8	5,638.0	162,594.4
Rafts	......	......	1,593.5	23,750.0	......	......	......	......	......	25,343.5	1,669,669.0
Total..........	1,667.2	708.2	3,383.7	23,750.0	156.7	162.7	57.4	223.3	872.3	30,981.5	1,832,263.4

The following table gives the totals in tons of the different classes of freight during the series of years 1890 to 1898:

TABLE 2.

Articles.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Hay, grain, etc	1,667	1,467	3,197	3,203	3,061	3,081	1,547	4,035	2,658
Live stock	708	686	1,131	920	847	144	416	425	209
Lumber, logs, wood, and railroad ties............	27,134	27,614	40,350	42,436	27,269	17,915	10,626	19,646	22,806
Sand and gravel............	163	15	102	....	113	....	....	....	....
Salt	57	85	96	83	69	80	23	29	28
Farm machinery and general merchandise.........	872	480	896	780	1,016	708	237	256	877
Produce............	223	114	131	122	136	135	80	67	5
Building material..........	157	54	391	....	....	....	....	....	....
Total............	30,981	30,515	46,294	47,544	32,511	22,058	12,929	24,458	26,083

Table 3 gives the comparative commerce expressed in mile-tons during the five years 1894–1898, this data having been secured only since the river was placed in charge of the Commission.

TABLE 3.

Class.	1898.	1897.	1896.	1895.	1894.
	Mile-tons.	*Mile-tons.*	*Mile-tons.*	*Mile-tons.*	*Mile-tons.*
Packets and miscellaneous boats.........	162,594	179,777	229,215	197,574	211,353
Rafts............	1,669,669	2,030,125	3,293,060	3,247,507	2,219,606
Total............	1,832,263	2,209,902	3,522,275	3,445,081	2,430,959

Very respectfully, your obedient servant,

A. H. BLAISDELL,
Assistant Engineer.

Capt. H. M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary, Missouri River Commission.

APPENDIX D.

ANNUAL REPORT ON LOCAL WORKS ABOVE KANSAS CITY, BY MR. SAMUEL H. YONGE, DIVISION ENGINEER.

MISSOURI RIVER COMMISSION,
Kansas City, Kans., March 17, 1899.

COLONEL: I have the honor to submit a report of operations conducted on works under my charge in improving the Missouri River for the fiscal year ending June 30, 1899.

NEBRASKA CITY, NEBR.

A few days before the close of the last fiscal year a strong eddy was formed immediately above Dike 1, constructed in May, 1896, by the meeting of the shore current and a cross current from a reef opposite and above the dike. Bank caving resulting, by which the flanking of the dike was threatened, I recommended that the bank immediately above the dike should be protected. My recommendation receiving your approval, a continuous frame mattress, extending 210 feet above the dike with a width of 50 feet at the dike, diminishing to 30 feet at 100 feet above, was constructed between July 1 and 9.

The cost of the above work amounted to $282.81 for material and $187.41 for labor.

ST. JOSEPH REVETMENT REPAIRS.

I was notified by your letter of August 24 of the approval of the Chief of Engineers, United States Army, of the project for repairs to the revetments in Bon Ton and Belmont bends in the vicinity of St. Joseph, Mo., at an estimated cost of $28,829.38.

The reach of the river embracing the above bends and Elwood Bend, extending from the head of Bon Ton Bend to the St. Joseph and Grand Island Railway Bridge at St. Joseph, has a channel length of 10.22 miles, with an average low-water slope of 0.641 foot per mile.

In 1881 and 1882, 4,380 feet of bank at the head of Bon Ton Bend were protected by revetment, the mattress work consisting of brush and wire net. This work was renewed in 1885, when the present revetment, which is 19,332 feet long, was begun.

The length of bank protected in 1885 was 10,500 feet, extending from 1 to 10. (See Pl. I.) In 1887 it was extended 4,158 feet from 10 to 11, and in 1889 completed by being extended 4,673 feet to 12, or within about 1,000 feet of the lower end of the main bank.

The repairs made to the revetment, according to the published reports, were as follows: In 1886, 150 linear feet of mat from 8 to 9 were renewed; in 1890 about 1,240 feet of the revetment from 2 to 3 and 190 feet from 5 to 6 reconstructed, and in 1891, 3,018 feet from 4 to 7 also reconstructed. In 1892 two breaks, aggregating 1,179 linear feet, were reconstructed and slight repairs made at six breaks aggregating 655 linear feet. In 1895 three large breaks, aggregating 706 linear feet, and nine minor breaks, amounting to 724 linear feet, were repaired and the stone ballast, which had been dislodged from parts of the upper bank, renewed. The location of repairs made in 1892 and 1895 are not given in the published Annual Reports. It is probable, however, that they were principally at points previously repaired.

The total length of bank repairs made in 1898 at the five breaks marked *c d e f* and *g* on Pl. I amounted to about 1,955 feet, making the total length of all repairs to date 9,821 feet.

Belmont revetment, extending from 13 to 18, having a length of 14,922 feet, was constructed in 1891. In the fall and winter of 1893, 3,750 feet from about 16 to 18 were reconstructed and the revetment extended downstream about 1,250 feet to 19, overlapping the then head of the Elwood revetment, to replace a slightly less extent of the latter work which had been flanked. In 1892 repairs were made to 739 feet of work distributed among fifteen small breaks. In 1893 two breaks, each 150 feet long, were repaired. Four minor breaks, amounting to 325 feet, were repaired in 1895, and in 1896 the junction of the revetment with that of Elwood Bend renewed. In addition to the foregoing repairs a considerable part of the stone ballast which had been dislodged from the upper bank was replaced in 1896. The location of breaks repaired in 1892–93 and 1895 are not given in the published reports.

The extent of broken work repaired in 1898 amounted to 2,270 feet, making the total length of repairs made to the revetment something over 6,634 feet.

Besides the above, there were constructed between June, 1892, and April, 1893, in the lower part of the bend between 17 and 18, 13 short permeable dikes for the purpose of correcting the alignment of the bank. These, however, were swept out the same month in which they were completed.

The locality known as Elwood Bend is the extension of Belmont Bend. Shortly after the construction of the St. Joseph and Grand Island Railway Bridge, the bridge company built 3 stone dikes in the bend. The locations of these dikes are shown on

Pl. I. A portion of the upper one was found on the opposite side of the channel last fall.

In 1879, 10,240 feet of the bank adjacent to the dikes were protected by a revetment of detached frame mattresses. In 1881 and 1882, over 4,000 feet of this work below the old stone Dike 2 were destroyed. This was replaced in 1882 and 1883 by a wire and brush mattress revetment on the then shore line behind the original work.

In 1885, three breaks aggregating 940 feet in length were repaired. In 1893, about 1,200 feet at the then head of the revetment were destroyed by flanking, the bank caving from Belmont Bend extending downstream to about that extent.

As the result of the above change in shore line, the flow was diverted from the part of the Elwood revetment below E, which has not been subjected since that time to severe stress.

It appears from the foregoing that the part of Bon Ton revetment which required the most extensive repairs is the upper 7,000 feet. The proximate cause of this seems to have been the impact of the diagonal flow out Kansas Chute against the revetment, the extension of the shore bar on the convex side downstream under the wearing away of the bend in the above chute, and from the formation of reefs in front of the revetment promoted by the above conditions. Eddies resulting from the natural irregularities in the shore line and those produced by pockets formed by bank caving, which had been repaired without restoring the shore line, also contributed.

The formation of break *g* probably originated in shore eddies resulting from the old launching ways at the head of the break and an uneven shore line; also from reef action from the opposite bar.

The frequent breaching of the revetment at the foot of Belmont Bend is traceable in part to reefs which formed in consequence of that part of the bend cutting too deep before it was properly revetted, and partly to eddy action produced by point X.

Break B–C at the head of the bend was caused by the flow out of Bon Ton Bend impinging abruptly against the revetment. The above action was brought about by the wearing away of about 1,000 feet of unprotected bank at the foot of Bon Ton Bend resulting in a movement downstream of the channel both in position and direction.

The caving at B–C was enhanced by seep water from the adjacent bluff, this action being very apparent while the repair work was in progress.

The floating plant having arrived from Nebraska City, field work was begun August 24.

Heavy rains during September interfered seriously with the progress of the work by making the roads impassable for several weeks for the teams employed for transporting brush and stone, most of which had to be wagoned on account of the few barges available.

All subaqueous work was completed just before the closing of the river by ice, and the entire work completed December 3.

The plan pursued in repairing the smaller breaks consisted of placing a braced pile fence in front of each pocket in line with the shore above and below and one or more fences across the pocket connecting the shore fence with the main bank. The shore fence and adjacent subbank were protected by a continuous mattress extending above and below the pocket and projecting 50 feet outside and 10 to 25 feet inside the fence.

The principal items of the work performed in making the above repairs, comprised driving and bracing 569 piles to an average penetration of 25.17 feet, weaving and ballasting 335,058 square feet of mattress, and placing 6,107 linear feet of screen.

At break B–C, Belmont Bend, where there are a considerable recession of shore line and depth of water, two rows of braced piles were used for the shore fence. At break *g* in Bon Ton Bend, four permeable dikes, reaching from the top of the bank to an imaginary line fairing up the shore line, were constructed.

The objects expected to be attained by these works are the prevention of the breaks enlarging, the breaking up of shore eddies, and building up of the bank in the pockets.

BON TON BEND REVETMENT REPAIRS.

Break g.—Break *g* consists of two deep pockets separated by a narrow point formed by a part of the old shore line and a straight stretch of broken bank below the lower pocket 90 feet long. The break extends over 875 feet of shore line.

The lengths of the four permeable dikes employed to correct and restore the shore line in the pockets proceeding in their order downstream are 134, 165, 108, and 88 feet, respectively. They are two-row structures, 10 feet between rows in about 15 feet bents. They are braced by the usual direct braces and two lines of wales formed by bolting and spiking together two 22-feet timbers breaking joints and forming a continuous member. The dimensions of the front wale timbers are 4 inches by 8 inches, those of the back wales 3 inches by 8 inches. This form of wale was used for all the repair work that required as large wale members as 6 inches by 8 inches, or 8 inches by 8 inches.

The use of built wales was made necessary on account of the lumber available consisting of unused stock, procured for another purpose at Nebraska City, being too light for the 15 feet dike panels.

The continuous wale has the advantage of distributing stress over the dike better than the detached wale usually employed. Less lumber is also required than for the detached wales. This, however, is offset by the cost of additional bolts and the labor of bolting the two parts together.

The repairs for the broken bank below the lower pocket consist of a pile fence 60 feet long.

The mattress work for break *g* was woven in twelve sections.

The shape of the break, positions of dikes, and sections of mattress are shown on Pl. II, the details of bracing on Pl. III, and those of the continuous wale on Pl. VI. The piles have an average penetration of 24.6 feet.

The repairs were completed in September, except attaching the screen, which was done in October.

Break c.—The breaks at *c* are situated in a pocket formed by a former break which had been repaired by renewing the revetment without restoring the shore line. The new breaks, one near the upper and the other near the lower end of the pockets, appeared to have been caused by strong eddies.

The repairs consisted of a shore fence 480 feet long, four cross fences having a total length of 325 feet, all carrying screen work, and 32,884 square feet of subaqueous mattress.

Cottonwood piles and elm wales were used for the fences. The piles have an average penetration of 25.6 feet.

The repairs were made between October 7 and 26. Pl. IV shows bank line and plan of the repairs.

Break d.—This break is the result of eddies formed by a projecting point. The repairs, the plan of which is shown on Pl. V, consist of shore fence with a short cross fence at the lower end extending 90 feet downstream from the point, and subaqueous mattress lapping well around the point and reaching a short distance below the fence.

The work was constructed between October 12 and 30.

Break e.—Pl. V shows the plan of the repairs to break *e*. They are of the same character as at c, and consist of 180 linear feet of shore fence, 90 feet of cross fences, and 12,447 square feet of mattress. The piles are cottonwood and the wales elm. The average penetration of the piles is 24.16 feet.

The above repairs were made between October 12 and 31.

Break f.—The probable causes of this break were shore eddies resulting from reef action and an irregular shore line. Indications point to former repairs being made at this locality.

The repairs are of the same general character as the others and are shown in plan on Pl. V. The shore fence masks a part of the break lying in a pocket. The mattress protection extends 100 feet along the straight bank above the pocket where there were indications of the break extending.

The work consists of 320 feet of shore fence and 110 feet of cross fences, made of cottonwood piles and elm wales, all with screen.

The repairs were made between September 21 and October 30.

BELMONT BEND.

Reballasting upper bank.—The slope of some parts of the bank near the head of Belmont revetment are as steep or even steeper than 1 on ½. The material composing the bank is principally blue clay. At these and other parts with flatter slopes, aggregating 3,969 square feet, the stone ballast which had been dislodged, probably by ice and driftwood and undermining of the bank, was renewed.

Break B–C.—This break was first observed in April, 1897, at which time it was 360 feet long. By October, 1898, it had attained a length of 1,500 feet, with a maximum width of erosion of 120 feet.

The bank is composed largely of gumbo, which accounts for its slow recession under the severe impact of flow out of Bon Ton Bend to which it was subjected.

The repair work for the part of the break where a pocket was formed by the recession of the shore consists of two rows of braced piles 1,350 feet long, 10 feet apart, in 15 feet bents, connected with the top of the bank by 12 fences, for the straight portion below the pocket of a single row of piling 150 feet long. (See Pls. VI and VII.)

The mattress was woven in one section 1,630 feet long, lapping the ends of the break. It has a width of 50 feet outside the front row of piling and extends 10 feet inside the inner row. Four three-eighths-inch wire strands placed about 15 inches apart near the stream selvage of the mat were used instead of the customary single large cable. All of these strands were attached to a single toggle stick about 6 feet long. The advantage gained by having a number of strands instead of the single cable is the distribution of stress over a larger mat surface. The long toggles also reduce the tendency of the mat selvage to curl over.

A screen of heavy poles is attached to each of the cross fences and to the wale of the inner line of piling of the two-row work. The cross fences, being quite high, are stayed by three-eighths-inch strand anchored on top of the bank.

The piling, which are pine, have an average penetration of 25.2 feet. They were driven between September 1 and 27. The mattress was constructed between October 19 and November 9, the bracing attached between November 1 and 17, and the screen placed in November.

ELWOOD BEND.

Breaks l. n. A.—As previously pointed out, frequent repairs and renewals have been made at the locality of these breaks. The principal cause appears to be an extensive eddy formed by the point above them (Pl. VIII) during high stages.

The shore fence at *l* and *n* was made in one stretch 380 feet long. Cottonwood piles and elm wales were used for its construction. Pine piles and braces were used for the shore and cross fences at A. The average penetration of the piles is 25.77 feet. The mattress for the three breaks was woven in one section 1,080 feet long, 50 feet wide outside of the shore fence, and extending back of the shore fences to the water's edge.

The pile driving for the breaks was done between September 28 and October 22, the mattress work between November 3 and 16, and the bracing and screening attached between November 18 and December 2.

Break o.—The break at *o* was repaired by a line of cottonwood piles to fair out the shore line and two cross fences made of cottonwood poles. The piles have an average penetration of 28.4 feet. The mattress has the same width as at the other breaks and is 120 feet long.

Break p.—The repairs at *p* consist of a mattress of the usual width 80 feet long. It was completed the day before floating ice appeared in the river.

Statement of extent and net cost of revetment repairs.

BON TON BEND.

BREAK *e*.

Class and extent of work, and quantities of material, etc.	Cost per unit.	Cost of each item.	Total.
40 shore-fence and 12 cross-fence piles placed by steam hammer:			
Labor, handling piles	....	$2.49	
2,278 linear feet cottonwood piling	$0.128+	292.54	
47½ bushels coal	.106+	5.06	
Labor, placing	....	99.82	
			$399.91
Weaving 32,884 square feet willow mattress:			
Labor, loading and unloading brush	....	66.12	
213 cords brush	1.293+	275.59	
10,175 feet ⅜-inch wire strand	.009+	93.06	
15 pounds No. 12 wire	.020+	.31	
240 clamps	.025+	6.21	
Labor, weaving	....	222.77	
			664.36
Ballasting 32,884 square feet willow mattress:			
Labor, loading stone	....	69.30	
159 cubic yards old stone	.932+	148.27	
84 cubic yards new stone	1.032+	86.74	
Labor, ballasting	....	31.33	
			335.64
Attaching 600 linear feet of built wale to shore and cross fence piles:			
2,843 feet B. M. elm lumber	16.577+	47.13	
64 screw bolts	.105+	6.78	
40 pounds washers	.023+	.93	
43½ pounds spikes	.021+	.92	
3 driftbolts	.14	.42	
Labor	....	44.65	
			100.83
Placing screen on 805 linear feet shore and cross fences:			
Labor, handling poles	....	22.65	
21.3 cords poles	3.688+	78.57	
121 pounds nails	.018+	2.24	
Labor, placing	....	71.27	
			174.73
Towing plant and material:			
Hire of towboat	....	115.40	
357 bushels coal	.106+	38.00	
			153.40
Total	....	....	1,828.87

Statement of extent and net cost of revetment repairs—Continued.

BON TON BEND—Continued.

BREAK *d*.

Class and extent of work, and quantities of material, etc.	Cost per unit.	Cost of each item.	Total.
9 shore-fence piles placed by steam hammer:			
859 linear feet cottonwood piling	$0.128+	$46.10	
7¼ bushels coal	.106+	.77	
Labor		16.55	
			$63.42
Weaving 9,812 square feet willow mattress:			
Labor, loading and unloading brush		22.35	
63 cords brush	1.293+	81.51	
2,680 feet ⅜-inch wire strand	.009+	24.59	
77 clamps	.025+	1.99	
Labor, weaving		76.94	
			207.38
Ballasting 9,812 square feet willow mattress:			
Labor, loading stone		16.73	
72 cubic yards stone	1.032+	74.35	
Labor, ballasting		19.12	
			110.20
Attaching 90 linear feet of built wale to shore-fence piles:			
288 feet B. M. elm lumber	16.577+	4.77	
9 screw bolts	.105+	.95	
8 pounds washers	.023+	.07	
Labor		5.15	
			10.94
Placing screen on 90 linear feet shore fence:			
Labor, handling poles		2.55	
2.4 cords poles	3.688+	8.85	
21 pounds nails	.018+	.39	
Labor, placing		6.52	
			18.31
Towing plant and material:			
Hire of towboat		28.25	
87¾ bushels coal	.106+	9.31	
			37.56
Total			447.81

BREAK *e*.

Class and extent of work, and quantities of material, etc.	Cost per unit.	Cost of each item.	Total.
19 shore-fence and 3 cross-fence piles placed by steam hammer:			
717 linear feet cottonwood piling	$0.128+	$92.08	
17¼ bushels coal	.106+	1.84	
Labor		25.08	
			$119.00
Weaving 12,447 square feet willow mattress:			
Labor, loading and unloading brush		28.47	
82 cords brush	1.293+	106.09	
4,147 feet ⅜-inch wire strand	.009+	37.93	
40 pounds No. 12 wire	.020+	.82	
115 clamps	.025+	2.97	
Labor, weaving		100.38	
			276.66
Ballasting 12,447 square feet willow mattress:			
Labor, loading stone		29.94	
81 cubic yards old stone	.932+	75.53	
Labor, ballasting		8.92	
			114.39
Attaching 230 linear feet of built wale to shore and cross fence piles:			
736 feet B. M. elm lumber	16.577+	12.20	
23 screw bolts	.105+	2.44	
7 pounds washers	.023+	.16	
Labor		14.73	
			29.53
Placing screen on 270 linear feet shore and cross fences:			
Labor, handling poles		6.92	
6½ cords poles	3.688+	23.98	
78 pounds nails	.018+	1.41	
Labor, placing		29.93	
			62.24
Towing plant and material:			
Hire of towboat		43.52	
134¾ bushels coal	.106+	14.31	
			57.83
Total			650.65

Statement of extent and net cost of revetment repairs—Continued.

BON TON BEND—Continued.

BREAK *f*.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
32 shore-fence and 6 cross-fence piles placed by steam hammer:			
Labor, loading piles		$6.38	
232 linear feet pine piling	$0.177+	49.97	
1,182 linear feet cottonwood piling	.128+	151.79	
29.6 bushels coal	.106+	3.15	
Labor, placing		41.17	$252.46
Weaving 22,586 square feet willow mattress:			
Labor, loading and unloading brush		46.75	
10 cords old brush	1.806+	18.06	
136 cords new brush	1.293+	175.96	
5,758 feet ⅜-inch wire strand	.009+	52.66	
85 pounds No. 12 wire	.020+	1.74	
158 clamps	.025+	4.09	
Labor, weaving		170.03	469.29
Ballasting 22,586 square feet willow mattress:			
Labor, loading stone		52.97	
60 cubic yards old stone	.923+	55.95	
126¼ cubic yards new stone	1.032+	130.02	
Labor, ballasting		39.45	278.99
Attaching 430 linear feet of built wale to shore and cross fence piles:			
1,181 feet B. M. elm lumber	16.577+	19.58	
35 screw bolts	.105+	3.71	
35 driftbolts	.14	4.90	
10 pounds washers	.023+	.23	
Labor		13.22	41.64
Placing screen on 430 linear feet shore and cross fences:			
Labor, handling poles		15.85	
14.9 cords poles	3.688+	54.96	
53 pounds nails	.018+	.98	
Labor, placing		51.47	123.26
Facing upper bank with brush and stone:			
5 cords old brush	1.806+	9.03	
10 cubic yards old stone	.932+	9.33	
Labor		12.32	30.68
Towing plant and material:			
Hire of towboat		82.39	
255 bushels coal	.106+	27.14	109.53
Total			1,305.85

BREAK *g*.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
4 mooring piles placed by steam hammer:			
152 linear feet cottonwood piling	$0.128+	$19.52	
3$\frac{1}{10}$ bushels coal	.106+	.33	
Labor		12.67	$32.52
67 dike and 5 shore fence piles placed by steam hammer:			
3,052 linear feet pine piling	.177+	540.84	
56$\frac{3}{10}$ bushels coal	.106+	5.98	
Labor		123.49	670.31
Weaving 74,182 square feet willow mattress:			
Labor, loading and unloading brush		109.77	
10 cords old brush	1.806+	18.06	
471 cords new brush	1.293+	609.40	
24,403 feet ⅜-inch wire strand	.009+	223.19	
505 clamps	.025+	13.06	
Labor, weaving		771.33	1,744.81
Ballasting 74,182 square feet willow mattress:			
Labor, loading stone		152.52	
511.2 cubic yards stone	1.032+	527.86	
90 pounds No. 12 wire	.020+	1.85	
Labor, ballasting		119.89	802.12

Statement of extent and net cost of revetment repairs—Continued.

BON TON BEND—Continued.

BREAK *g*—Continued.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
Attaching top braces and wales to 473 linear feet of 2-row dike and wales to 90 linear feet shore fence:			
Labor, loading lumber	....	$5.19	
8,972 feet B. M. yellow pine lumber	$20.76	186.26	
317 feet B. M. elm lumber	16.577+	5.26	
290 screw bolts	.105+	30.73	
438 pounds spikes	.021+	9.31	
80 pounds washers	.023+	1.87	
Labor, framing and bolting	....	130.58	
			$369.20
Placing and fastening 34 stay cables:			
1,667 feet ⅝-inch wire cable	.038+	64.28	
750 feet ⅜-inch wire strand	.009+	6.86	
2 pounds nails	.018+	.04	
6½ pounds spikes	.021+	.13	
Labor	....	32.44	
			103.75
Placing screen on 563 linear feet dike and shore fence:			
Labor, handling poles	....	25.90	
24.4 cords poles	3.688+	90.00	
208 pounds nails	.018+	3.86	
Labor, placing	....	73.57	
			193.33
Grading banks at ends of 4 dikes and 3 shoulders of break:			
Labor	....	69.17	69.17
Ballasting 4,859 square feet of bank:			
58.8 cubic yards new stone	1.032+	60.72	
90.4 cubic yards old stone	.932+	84.30	
26 cords old brush	1.806+	46.96	
Labor	....	68.66	
			260.64
Washing out deposit:			
Hire of towboat	....	22.50	
75 bushels coal	.106+	7.98	
			30.48
Towing plant and material:			
Hire of towboat	....	294.59	
910½ bushels coal	.106+	96.91	
			391.50
Total	....	....	4,667.83

BELMONT BEND.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
Renewing bank ballast for 3,969 square feet of bank at head of bend:			
87 cubic yards stone	$1.032+	$89.84	
Labor	....	61.88	
			$151.72
Towing plant and material:			
Hire of towboat	....	10.45	
32½ bushels coal	.106+	3.46	
			13.91
Total	....	....	165.63

BREAK B-C.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
1 mooring pile, 191 dike piles, 40 cross fence, and 10 shore fence piles placed by steam hammer:			
Labor, loading piles	....	$7.63	
45 linear feet cottonwood piling	$0.128+	5.78	
11,458 linear feet pine piling	.177+	2,030.47	
120 bushels coal	.106+	12.77	
Labor, placing	....	357.04	
			$2,413.69
Weaving 105,519 square feet willow mattress:			
Labor, loading and unloading brush	....	290.60	
684 cords brush	1.293+	884.99	
24,838 feet ⅜-inch wire strand	.009+	227.17	
482 clamps	.025+	12.46	
Labor, weaving	....	685.82	
			2,101.04
Ballasting 105,519 square feet willow mattress:			
Labor, loading stone	....	239.70	
815 cubic yards stone	1.032+	841.56	
220 pounds No. 12 wire	.020+	4.51	
Labor, ballasting	....	195.52	
			1,281.29

Statement of extent and net cost of revetment repairs—Continued.

BELMONT BEND—Continued.

BREAK B-C—Continued.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
Attaching top braces and wales to 1,350 linear feet 2-row dike, and built wale to 165 linear feet shore fence, and 809 linear feet cross fence:			
Labor, loading lumber	....	$21.17	
23,448 feet B. M. yellow pine lumber	$20.76	486.78	
1,100 feet ⅜-inch wire strand	.009+	10.06	
857 screw bolts	.105+	90.81	
10 driftbolts	.14	1.40	
242 pounds washers	.023+	5.65	
1,060 pounds spikes	.021+	22.53	
Labor, framing and bolting	....	302.82	$941.22
Placing and fastening 90 stay cables:			
7,006 feet ⅝-inch wire cable	.038+	270.17	
9 pounds nails	.018+	.17	
95 pounds spikes	.021+	2.02	
Labor	....	92.46	364.82
Placing screen on 2,324 linear feet, dike and fence:			
Labor, handling poles	....	123.14	
98.3 cords poles	3.688+	362.59	
492 pounds nails	.018+	9.12	
Labor, placing	....	282.32	777.17
Towing plant and material:			
Hire of towboat	....	542.84	
1,677½ bushels coal	.106+	178.55	721.39
Total	....	....	8,600.62

ELWOOD BEND.

BREAKS *l*, *n*, A.

94 shore fence and 20 cross fence piles placed by steam hammer:			
Labor, handling piles	....	$14.53	
1,712 linear feet cottonwood piling	$0.128+	219.86	
2,798 linear feet pine piling	.177+	495.83	
86$\frac{8}{10}$ bushels coal	.106+	9.22	
Labor	....	177.77	$917.21
Weaving 66,231 square feet willow mattress:			
Labor, loading and unloading brush	....	311.03	
429 cords brush	1.293+	555.06	
18,424 feet ⅜-inch wire strand	.009+	168.51	
293 clamps	.025+	7.58	
Labor, weaving	....	511.40	1,553.58
Ballasting 66,231 square feet willow mattress:			
Labor, loading and teaming stone	....	186.89	
267 cubic yards old stone	.932+	248.98	
252 cubic yards new stone	1.032+	260.21	
107½ pounds No. 12 wire	.020+	2.20	
Labor, ballasting	....	129.74	828.02
Attaching 1,365 linear feet of built wale to shore and cross fence piles:			
Labor, loading lumber	....	10.71	
4,756 feet B. M. yellow pine lumber	20.76	98.73	
1,440 feet B. M. elm lumber	16.577+	23.87	
202 screw bolts	.105+	21.40	
64 pound washers	.023+	1.49	
153 pounds spikes	.021+	3.25	
7½ pounds No. 12 wire	.20 +	.15	
Labor, framing and bolting	....	99.96	259.56
Placing screen on 1,461 linear feet shore and cross fences:			
Labor, handling poles	....	54.53	
18.5 cords poles	3.688+	68.24	
282 pounds nails	.018+	5.23	
Labor, placing	....	108.78	236.78
Towing plant and material:			
Hire of towboat	....	261.45	
808½ bushels coal	.106+	86.06	347.51
Total	....	....	4,142.66

Statement of extent and net cost of revetment repairs—Continued.

ELWOOD BEND—Continued.

BREAK *o*.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
11 shore fence piles placed by steam hammer:			
464 linear feet cottonwood piling	$0.128+	$59.59	
8 7/10 bushels coal	.106+	.92	
Labor		19.37	$79.88
Weaving 6,970 square feet willow mattress:			
Labor, loading and unloading brush		32.63	
45 cords brush	1.293+	58.22	
2,310 feet ⅜-inch wire strand	.009+	21.13	
30 clamps	.025+	.78	
Labor, weaving		52.38	165.14
Ballasting 6,970 square feet willow mattress:			
Labor, loading stone		19.45	
54 cubic yards old stone	.932+	50.36	
10 pounds No. 12 wire	.020+	.21	
Labor, ballasting		9.88	79.90
Attaching 115 linear feet of built wale to shore-fence piles:			
320 feet B. M., elm lumber	16.577+	5.30	
11 screw bolts	.105+	1.17	
2½ pounds washers	.023+	.06	
5 pounds No. 12 wire	.020+	.10	
1 pound spikes	.021+	.02	
Labor		8.21	14.86
Placing screen on 164 linear feet of shore fence:			
Labor, handling poles		6.09	
2 cords poles	3.688+	7.38	
66 pounds nails	.018+	1.22	
Labor, placing		12.60	27.29
Towing plant and material:			
Hire of towboat		25.59	
78⅞ bushels coal	.106+	8.36	33.65
Total			400.72

BREAK *p*.

Class and extent of work, and quantities of materials, etc.	Cost per unit.	Cost of each item.	Total.
Weaving 4,427 square feet willow mattress:			
Labor, loading and unloading brush		$20.31	
28 cords brush	$1.293+	36.23	
1,200 feet ⅜-inch wire strand	.009+	10.98	
25 clamps	.025+	.65	
Labor, weaving		41.03	$109.20
Ballasting 4,427 square feet willow mattress:			
Labor, loading stone		11.53	
32 cubic yards old stone	.932+	29.84	
10 pounds No. 12 wire	.020+	.21	
Labor, ballasting		6.37	47.95
Towing plant and material:			
Hire of towboat		10.82	
33⅝ bushels coal	.106+	3.57	14.39
Total			171.54

RÉSUMÉ.

Net cost Break *e*	$1,828.87	
Net cost Break *c*	659.65	
Net cost Break *d*	447.81	
Net cost Break *f*	1,305.85	
Net cost Break *g*	4,667.83	
Net cost renewing bank ballast, Belmont Bend	165.63	
Net cost Break B-C	8,600.62	
Net cost Breaks *l*, *n*, A	4,142.66	
Net cost Break *o*	400.72	
Net cost Break *p*	171.54	
		$22,391.18

Statement of extent and net cost of revetment repairs—Continued.

RÉSUMÉ—Continued.

Superintendence and office work August 1 to November 30	$1,849.89	
Survey work	455.75	
Subsistence and plant and supplies purchased	896.20	
Observing national holiday	108.74	
Care of plant	1,377.96	
Repairs to plant	186.50	
Preparing for work and incidental expenses	730.21	
Moving plant by hand	47.48	
Moving plant and material, Nebraska City, Nebr., to St. Joseph, Mo	2,024.50	
Towing and handling pine piles from Fort Leavenworth, Kans	328.56	
		$8,005.79
Total		30,396.97

The above total includes $3,888.89 for piling and lumber brought from Nebraska City and Fort Leavenworth.

CONSTRUCTION MATERIAL.

The pine lumber used for repairs was brought from Nebraska City; also 251 pine piles, both materials having been procured for work at that point which was not constructed. The remainder of the pine piling used was brought from Fort Leavenworth, and consisted of 87 sticks furnished for work at that point which was not constructed, and 101 sticks which had been rejected on account of not having sufficient heartwood, but afterwards purchased at a lower figure than the contract price.

The total quantity of stone used was 2,756.9 cubic yards, procured as follows: 1,311 yards delivered in Belmont Bend and 696.5 yards in Bon Ton Bend, at 90 cents and $1 per cubic yard, respectively, both under informal contract; also 241.4 yards and 517 yards from Bon Ton and Belmont Bends, respectively, where it had been stored in 1895.

The willow brush used amounted to 2,202 cords. Of this quantity 51 cords were old brush brought from Nebraska City and 2,151 cords procured by day's labor. With the exception of 681 cords barged from Burr Oak Bottom, it was wagoned to the sites of the works. The average cost of the brush, including stumpage, amounted to $1.293 per cord.

Two hundred and five cords of screen poles were procured by day's labor at an average cost of $3.68 per cord.

One hundred and seventy-two cottonwood piles were procured by day's labor at a cost of 12.6 cents per linear foot, including stumpage and delivery on barges.

The elm lumber used for wales at the minor breaks was purchased in open market at $14.35 per 1,000 feet B. M.

TOWBOAT SERVICE.

The towboat *John R. Hugo* was employed for moving plant and towing. The cost of the former service, consisting of moving plant from Nebraska City, Nebr., to St. Joseph, Mo., amounted to $1,108.62, and of the latter to $2,057.71, including fuel.

MOVING PLANT.

On receiving your oral instructions on July 15 to move the plant lying in ordinary at Nebraska City, Nebr., and the material remaining over from work at that point to St. Joseph, Mo., the master of the towboat *John R. Hugo*, which was at Omaha, Nebr., was notified to bring the boat to Nebraska City, and other arrangements made for moving down the river. On account of delay in getting a satisfactory boat's crew, the first tow could not be forwarded till July 30.

The plant moved consisted of twelve pieces; also horse capstans, skiffs, pontons, rope, and tackle. The material comprised piling, lumber, brush, etc., having an aggregate tonnage of 550 tons.

Moving was completed August 18.

The cost of the work, including loading material on barges at Nebraska City and unloading at St. Joseph, towboat hire, fuel, etc., amounted to $2,024.50.

On November 10 the *Hugo* left St. Joseph, Mo., for Kansas City with a tow of plant and material for work on the Kaw River. The boat reached St. Joseph on its return trip November 14. On November 19 a second tow was forwarded from St. Joseph, but did not get below Kickapoo, Kans., where it had to tie up on account of a gale. The gale was followed by a blizzard, which culminated in the closing of the river by ice and compelled the laying up for the winter at the above locality of boat and a tow.

The cost of moving plant from St. Joseph to Kickapoo and Kansas City, including towboat hire, fuel, and loading and unloading material, amounted to $981.80.

LEAVENWORTH, KANS.

I was notified by your letter of October 15, 1898, of the approval of the Chief of Engineers, United States Army, of your project for constructing a dike opposite Leavenworth, Kans.

The object of the dike, set forth in the project, is to cut off the flow across the accretions formed below Dike 2, constructed in 1895, and impound the water in the old shore channel, now a slough, along the left bank, and by promoting deposit and a growth of willows in it to prevent erosion along the work placed by the Leavenworth Bridge and Terminal Company for the protection of the east bridge approach.

The plan of the dike is a two-row pile structure projecting 350 feet beyond the shore bar, with an inshore extension 270 feet long to about standard high water, where it connects with a shale levee forming a part of the bridge company's protection work; the latter part of the work to consist of a screen supported by two rows of braced poles driven through a ballasted mattress 25 feet wide.

The location of the dike is shown on Pl. IX.

Four hundred and fifty-four and seven-tenths cubic yards stone riprap were furnished under informal contract in November and December, and 186 cords brush and 6 cords poles procured by day's labor in December and January. These materials were delivered on the bank of the river near the shore end of the dike.

As the inshore extension of the dike lies across a mud bar over which it would ordinarily be difficult, if not impossible, to weave mattress, that part of the dike work was constructed in December, while the mud was frozen. The structural part of the dike was not constructed in the fall on account of the low stage of water making the dike site inaccessible for the floating plant.

KAW RIVER DIKES.

For many years prior to 1888 the channel of the Missouri River in the vicinity of Kansas City, Mo., and Kansas City, Kans., occupied a bend reaching upstream from the Hannibal and St. Joe Railroad bridge for a distance of about 3 miles. In the above year changes in the reach above the bend caused the formation of a middle ground below the mouth of the Kaw River with a narrow chute between it and the right bank, occupied at low stages by the discharge of the Kaw, while the flow of the Missouri was confined principally to the left-hand chute.

In 1889 the National Waterworks Company, of New York, constructed a substantial pile dike across the right-hand chute, ostensibly to protect the company's land and high-service pumping station, then situated immediately below the mouth of the river.

The dike appears on Pl. X, marked "N. W. W. Co.'s Dike."

As a result of the above-mentioned tendency of the Missouri to change the channel accentuated by the dike, extensive accretions were formed above and below the dike, and the mouth of the Kaw extended into the bed of the Missouri about one-fourth mile. This resulted in a diminution of the flat slope of the former stream. The flow of the Kaw is still further impeded by its direction being at right angles to that of the Missouri at their confluence, which increases the natural tendency to bar formation in the mouth of the tributary.

As the Kaw River receives the drainage of considerable areas of both Kansas City, Mo., and Kansas City, Kans., including the stock yards and several extensive meat-packing establishments, the quantity of sewage carried on the lower reach in proportion to the stream's low-water discharge is quite high. This part of the river, therefore, often becomes offensive when its flow is backed up and impeded by the Missouri.

By act of Congress of July 1, 1898, an allotment was made from the appropriation for the improvement of the Missouri River from its mouth to Sioux City, Iowa, for work at the mouth of the Kaw to remedy the above unsanitary condition.

By your letter of October 12, 1898, I was notified of the approval of your project by the Chief of Engineers, United States Army.

It was proposed in the project to concentrate the low-water flow by two low dikes, so as to deepen the channel through the bar at the river's mouth.

Steps were at once taken to procure the necessary dike material, and, as soon as the towboat employed on the work under construction in the vicinity of St. Joseph could be spared, a pile driver and barge, with necessary piling, lumber, etc., forwarded.

After deepening the water at the sites of the proposed dikes sufficiently to float the driver, by washing with the towboat's wheel, pile driving was proceeded with. This branch of the work occupied from November 14 to 18. Work was then suspended on account of the freezing of the river. It was resumed December 7, between which date and December 14 the dike foot mattress was woven. As at that time the part of the river at the dikes was frozen, the mattress was woven on top of the ice, hich was cut around the mattress after the latter was ballasted. The bracing was :tached between December 14 and 22.

The dike screens were not attached, as the poles procured for that purpose at St. oseph could not be barged on account of the river being frozen.

The dikes consist of two rows of braced piles in 10-foot bents. Dike A contains 6 bents and Dike B 14 bents. Pine piles were used for the five outer bents of Dike ι and four outer bents of Dike B, and cottonwood piles for the inner bents.

Diagrams of the dikes are shown on Pl. XI.

It was originally intended to boat the brush and stone from points of delivery on he river's bank to the dikes. On account, however, of the low stage of water and he river being partly frozen when the dikes were building, these materials had to ›e wagoned, entailing an extra expense of about $150.

The cost and extent of the dikes are contained in the following exhibit:

STATEMENT OF EXTENT AND NET COST OF DIKE WORK.

DIKE A.

Class and extent of work and quantities of material, etc.	Cost per unit.	Cost of each item.	Total.
34 dike piles placed by steam hammer:			
Labor, handling piles	....	$6.94	
449 linear feet pine piling	$0.177+	79.57	
645 linear feet cottonwood piling	.108+	69.72	
20 bushels coal	.106+	2.13	
Labor, placing	....	46.60	
			$204.96
Weaving 200 linear feet (10,445 square feet) willow mattress:			
Loading and teaming brush	....	21.28	
59½ cords brush	2.484+	147.80	
1,757 feet ⅜-inch wire strand	.007+	13.48	
54 clamps	.055+	2.97	
Labor, weaving	....	97.79	
			283.32
Ballasting 200 linear feet (10,445 square feet) willow mattress:			
Labor, teaming stone	....	63.26	
83 cubic yards stone	1.075+	89.26	
10 pounds No. 12 wire	.020+	.21	
Labor, ballasting	....	33.60	
			186.33
Attaching top braces and built wale to 150 linear feet 2-row dike:			
Labor, teaming lumber	....	2.82	
2,688 feet B. M. yellow pine lumber	20.76	55.80	
91 bolts	.105+	9.64	
60 pounds washers	.023+	1.40	
15 pounds nails	.018+	.28	
125 pounds spikes	.021+	2.66	
Labor, framing and bolting	....	34.78	
			107.38
Shore connection:			
375 feet B. M. yellow pine lumber	20.76	7.81	
14 bolts	.105+	1.48	
5 pounds washers	.023+	.12	
17 pounds spikes	.021+	.36	
35 cubic yards stone	1.075+	37.64	
Labor	....	19.29	
			66.70
Washing out deposit on dike site:			
Hire of towboat	....	22.50	
45 bushels coal	.106+	4.79	
			27.29
Total	....	....	875.98

Statement of extent and net cost of dike work—Continued.

DIKE B.

Class and extent of work and quantities of material, etc.	Cost per unit.	Cost of each item.	Total.
30 dike piles placed by steam hammer:			
Labor, handling piles		$6.10	
421 linear feet pine piling	$0.177+	74.61	
540 linear feet cottonwood piling	.108+	58.37	
20 bushels coal	.106+	2.13	
Labor, placing		31.05	
			$172.26
Weaving 184 linear feet (9,725 square feet) willow mattress:			
Labor, teaming brush		18.38	
55 cords brush	2.484+	137.86	
1,425 feet ⅜-inch wire strand	.007+	10.94	
32 clamps	.055+	1.76	
Labor, weaving		98.11	
			267.05
Ballasting 184 linear feet (9,725 square feet) willow mattress:			
Labor, teaming stone		58.31	
77 cubic yards stone	1.075+	82.81	
7 pounds No. 12 wire	.020+	.14	
Labor, ballasting		35.71	
			176.97
Attaching top braces and built wale to 130 linear feet 2-row dike:			
Labor, teaming lumber		4.00	
1,728 feet B. M. yellow pine lumber	20.76	35.87	
102 bolts	.105+	10.81	
40 pounds washers	.023+	.93	
8 pounds nails	.018+	.15	
75 pounds spikes	.021+	1.59	
Labor, framing and bolting		26.60	
			79.95
Shore connection:			
768 feet B. M. yellow pine lumber	20.76	15.94	
65 cubic yards stone	1.075+	69.90	
9 bolts	.105+	.95	
5 pounds nails	.018+	.09	
40 pounds spikes	.021+	.85	
7 pounds washers	.023+	.16	
Labor		22.29	
			110.18
Washing out deposit on dike site:			
Hire of towboat		22.50	
45 bushels coal	.106+	4.79	
			27.29
Total			833.70

EAST BOTTOMS REVETMENT.

From an inspection made of the East Bottoms revetment, September 7, 1898, in pursuance of your previously given oral instructions, it appeared that parts of the work situated between 500 and 1,300 feet above its lower end had settled slightly.

Although none of the breaks were of great extent or of a serious nature, repairs appeared advisable to check probable enlargement in event of the work being subjected to severe stress.

The revetment was constructed in 1887, and has a length of about 9,000 feet.

The principal causes of the settling appeared to be eddy action resulting from an uneven bank line. Reef action caused by the formation of a middle ground at low stages was probably contributary.

Stone and brush were procured and stored near the site of the work during November with a view to making the repairs at that time. This, however, was prevented by the river being closed by ice.

CARE OF PLANT.

During the period between the close of the last fiscal year and the moving of plant from Nebraska City to St. Joseph, three watchmen were employed watching and attending to the plant lying in ordinary at the former point.

The sudden setting in of the winter on November 20, while the plant was being moved from St. Joseph to the mouth of the Kaw River, prevented carrying out the plan of wintering all the boats in the mouth of that stream and made it necessary to lay them up at the three different points where they happened to be on that date.

The office boat and two 64-foot barges were laid up in Elwood Bend above St. Joseph; two small quarter boats, two 64-foot barges and one 100-foot barge, near the head of Kickapoo Chute, and two pile drivers and one 100-foot barge in the Kaw River. This arrangement made the employment of three sets of watchmen necessary.

Considerable ice cutting was done at all of these points to make the boats safe

ORT FOR 1899 OF SAML. H. YONGE, DIV. ENG'R.

THE NORRIS PETERS CO.

Eng 56 1

PLATE II

OURI RIVER COMMISSION.

BREAK 8,

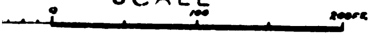
Ton Revetment, in vicinity of

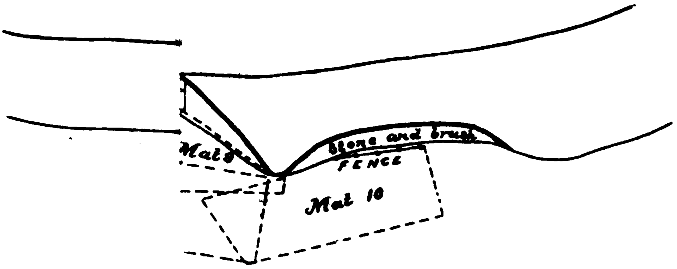
ST. JOSEPH, MO.

made in Summer and Fall 1898.

Approx. Stage = S.L.W.

SCALE





am'l. H. Yonge, Division Engineer.

Eng 56 1

PLATE IV

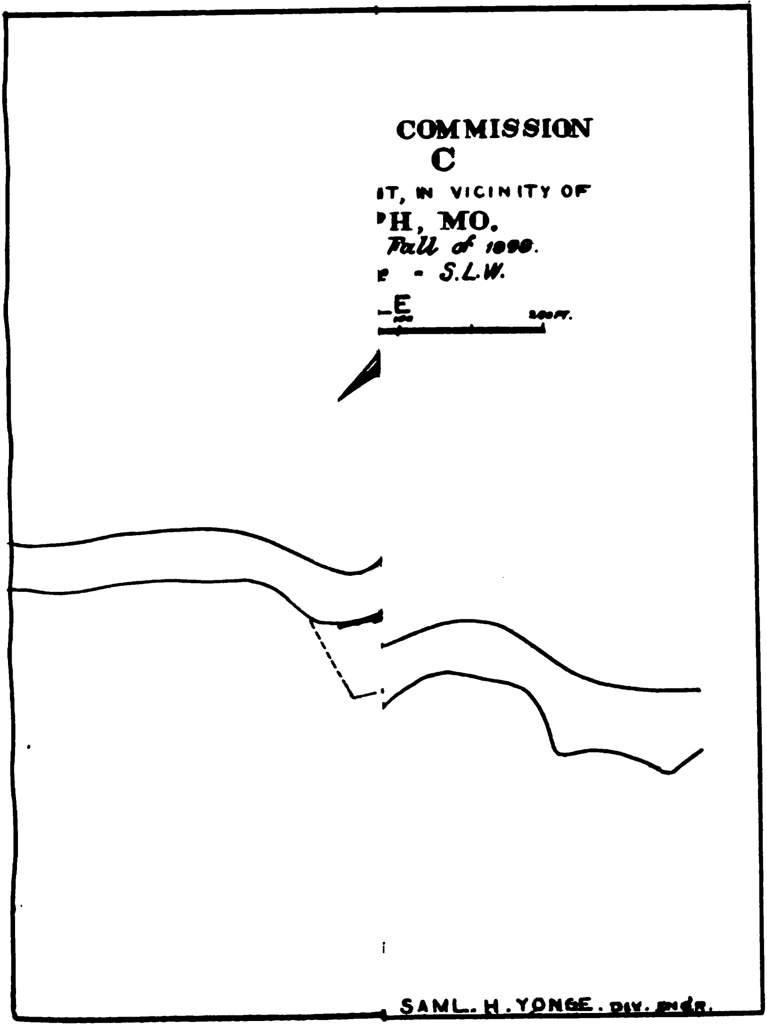


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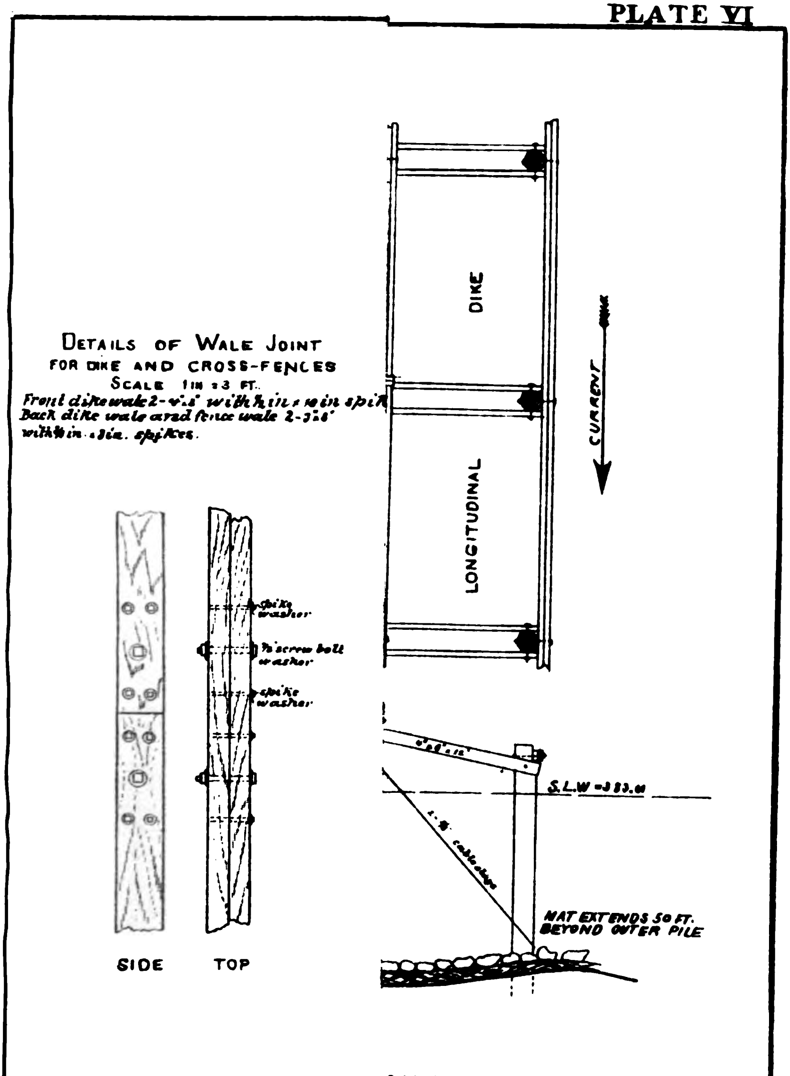
PLATE VI

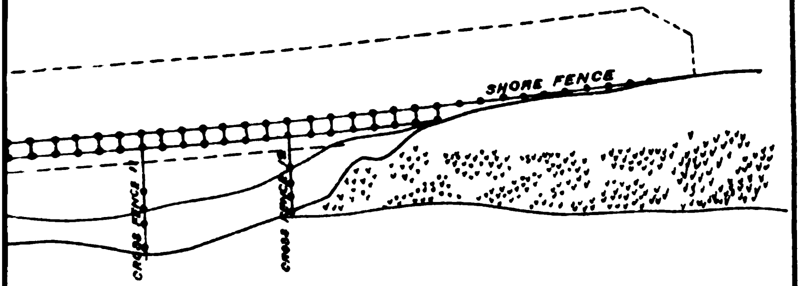


SAML. H. YONGE, DIV. ENG'R

[illegible] CO. PHOTO LITHO. WASHINGTON, D. C.

Eng 56 1

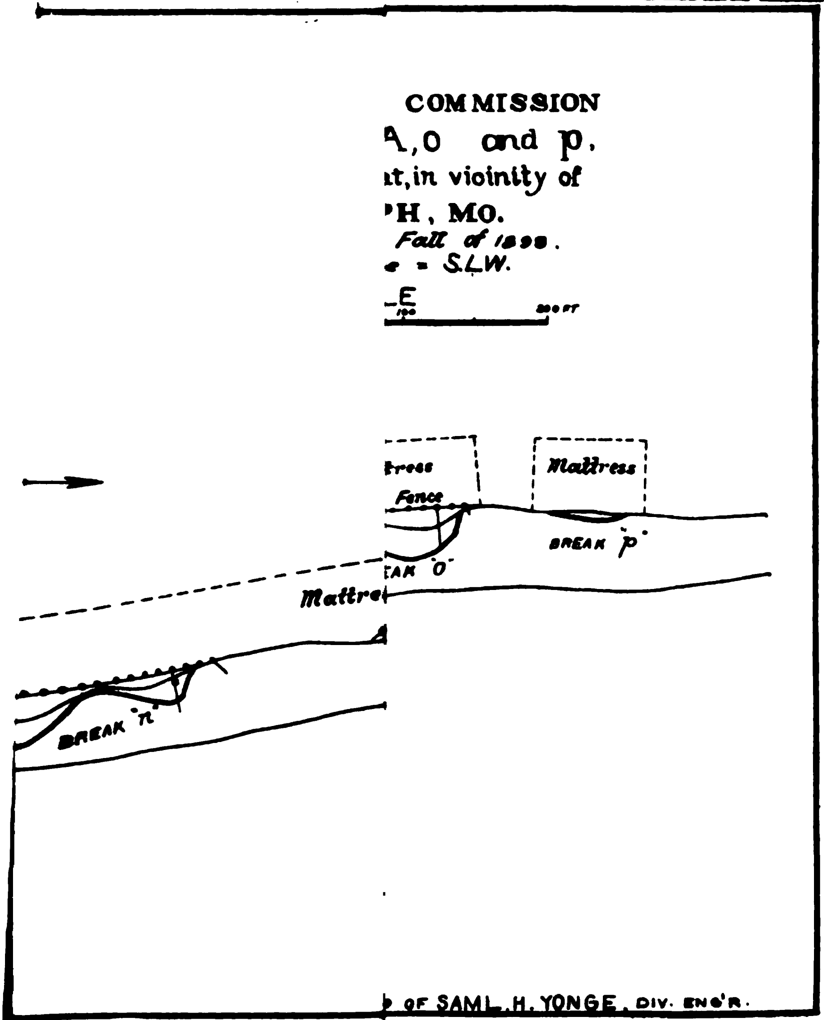
PLATE VII



NY ANNUAL REPORT FOR 1899 OF SAM'L. H. YONGE, DIV. ENG'R.

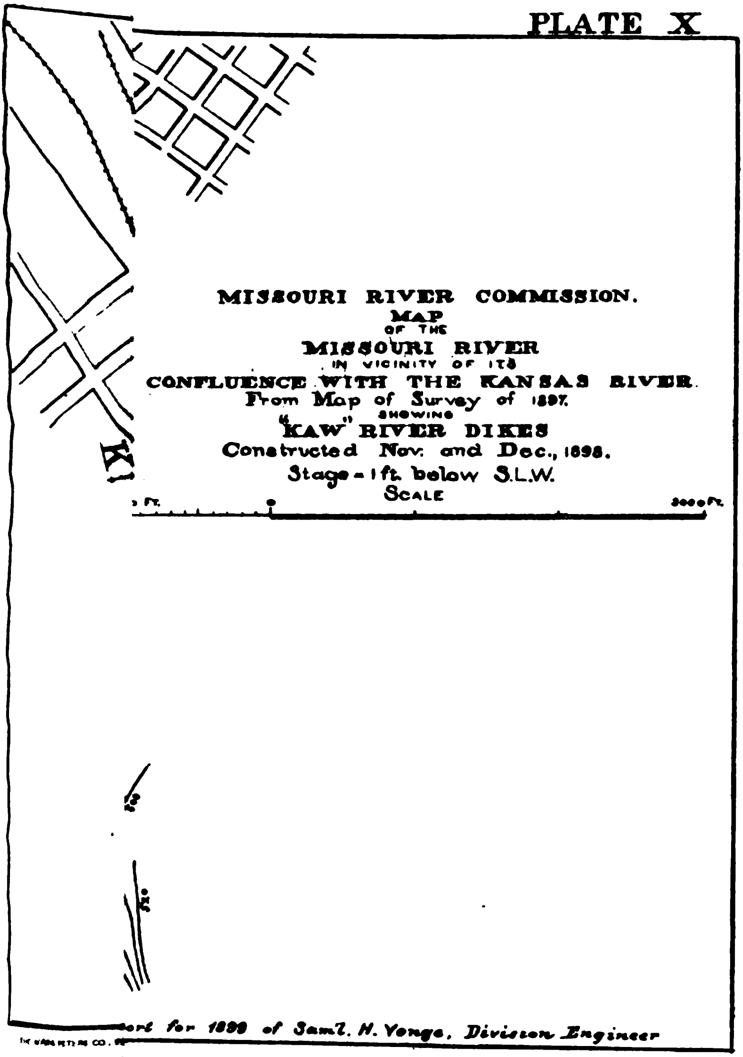
Eng 56 1

PLATE VIII



Eng 56 1

PLATE X

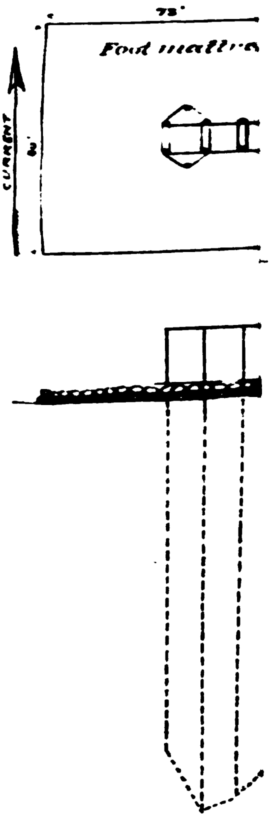


MISSOURI RIVER COMMISSION.
MAP
OF THE
MISSOURI RIVER
IN VICINITY OF ITS
CONFLUENCE WITH THE KANSAS RIVER.
From Map of Survey of 1897.
SHOWING
"KAW" RIVER DIKES
Constructed Nov. and Dec., 1898.
Stage - 1 ft. below S.L.W.
SCALE

ort for 1899 of Saml. H. Yonge, Division Engineer

THE NORRIS PETERS CO.

PLATE XI



MISSOURI RIVER COMMISSION.
DIAGRAMS
OF
"KAW" RIVER DIKES
CONSTRUCTED NOV. AND DEC., 1898

SCALES

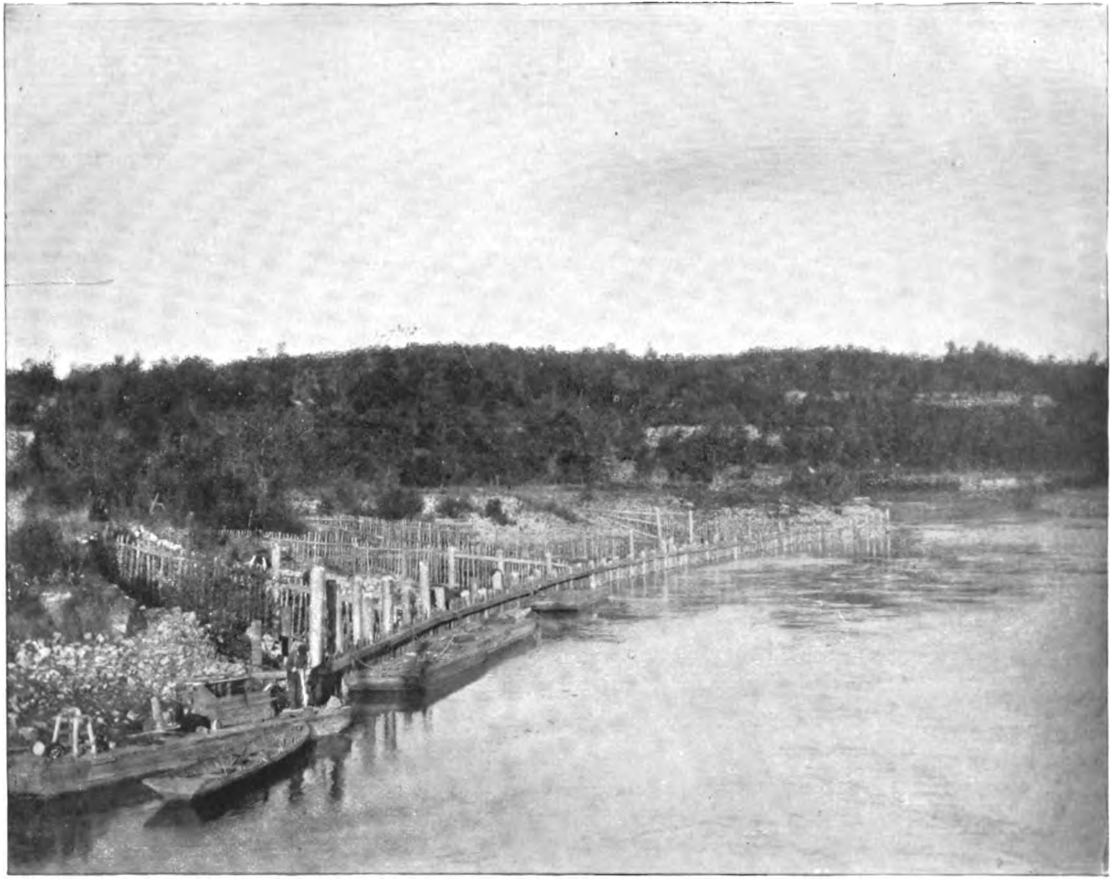
HORIZONTAL

VERTICAL 10 FT

FOR 1899 OF SAML. H. YONGE, DIV. ENGR.

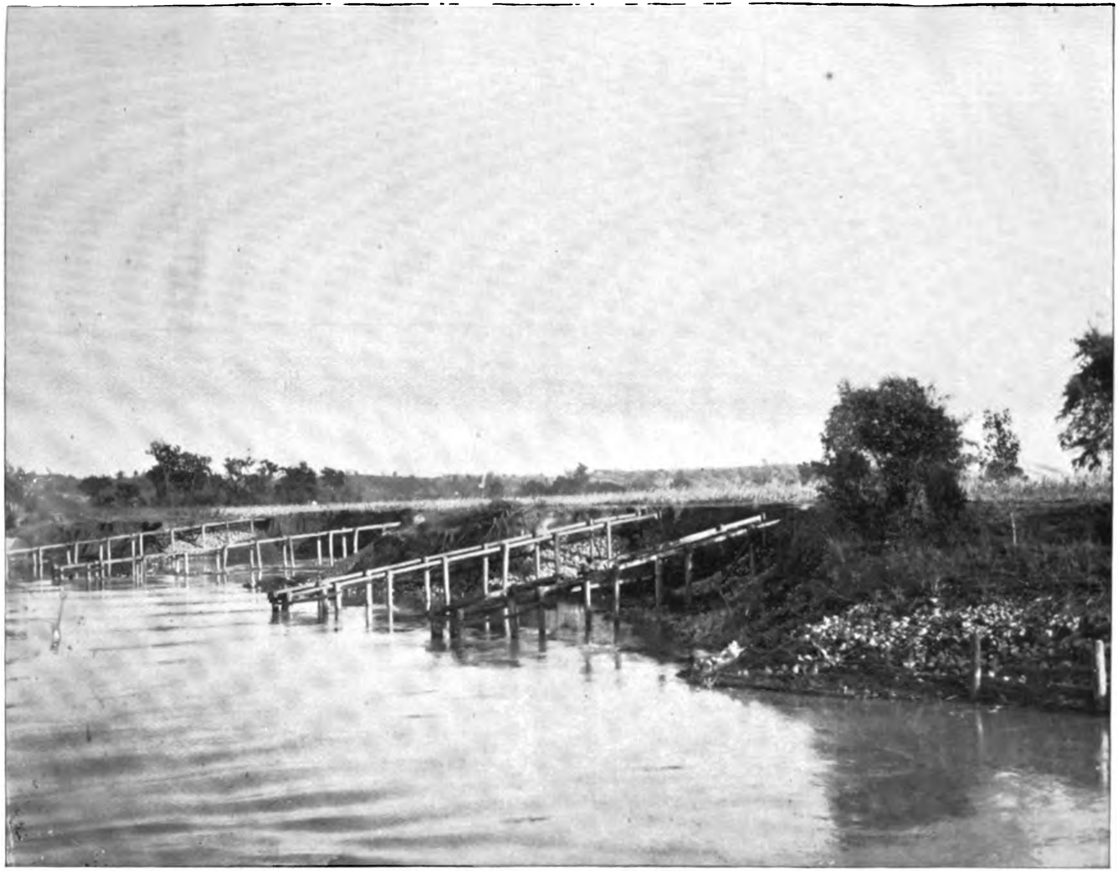
Eng 56 1

MISSOURI RIVER COMMISSION, ST. JOSEPH REVETMENT. PLATE I.

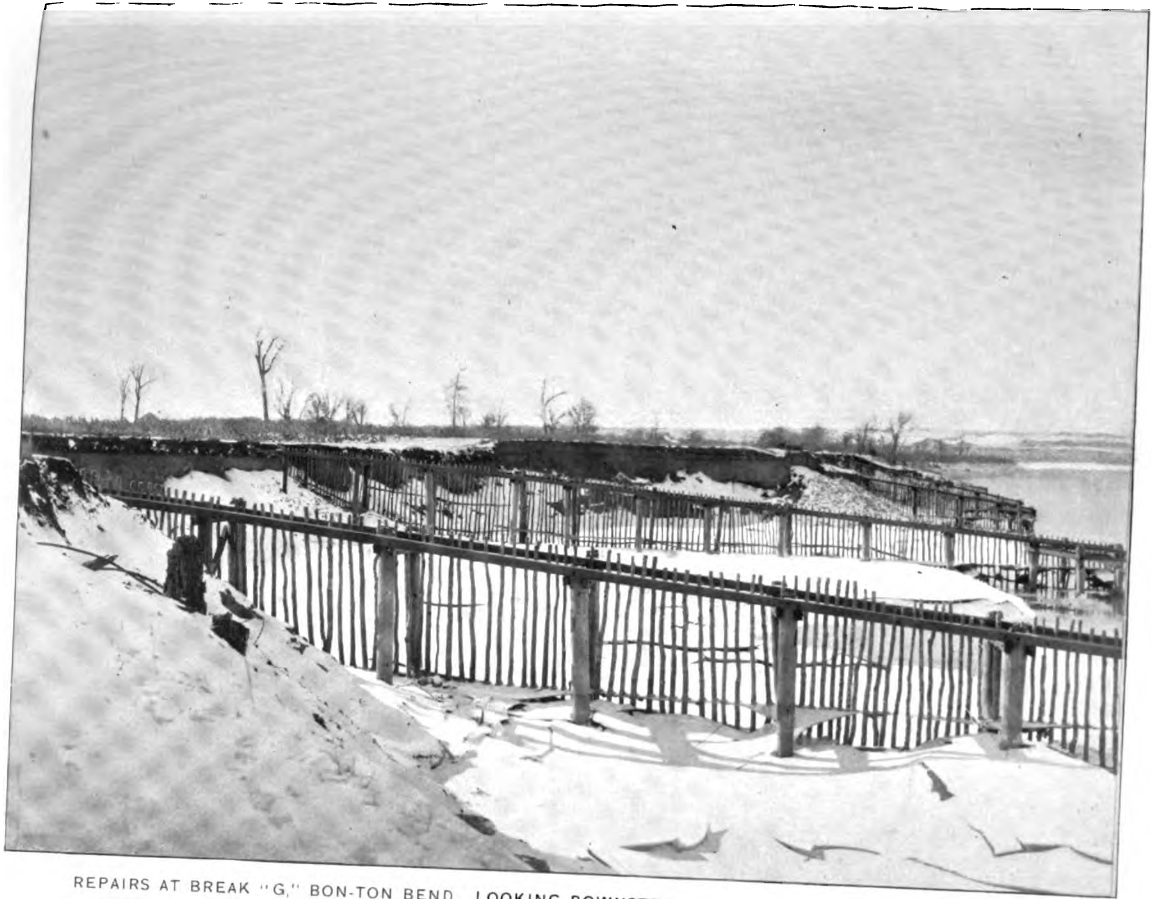


REPAIRS AT BREAK "C." BON-TON BEND. OCTOBER 23. 1898.

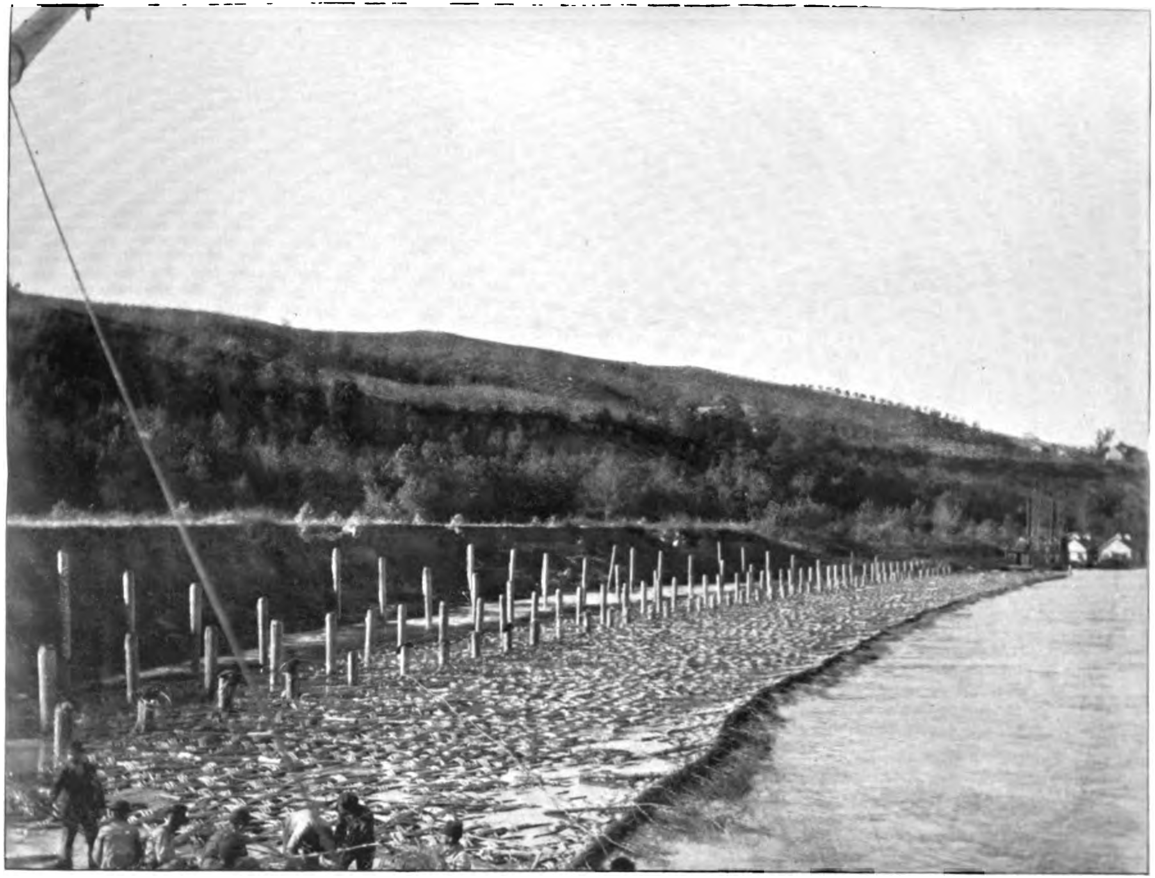
MISSOURI RIVER COMMISSION, ST. JOSEPH REVETMENT. PLATE II.



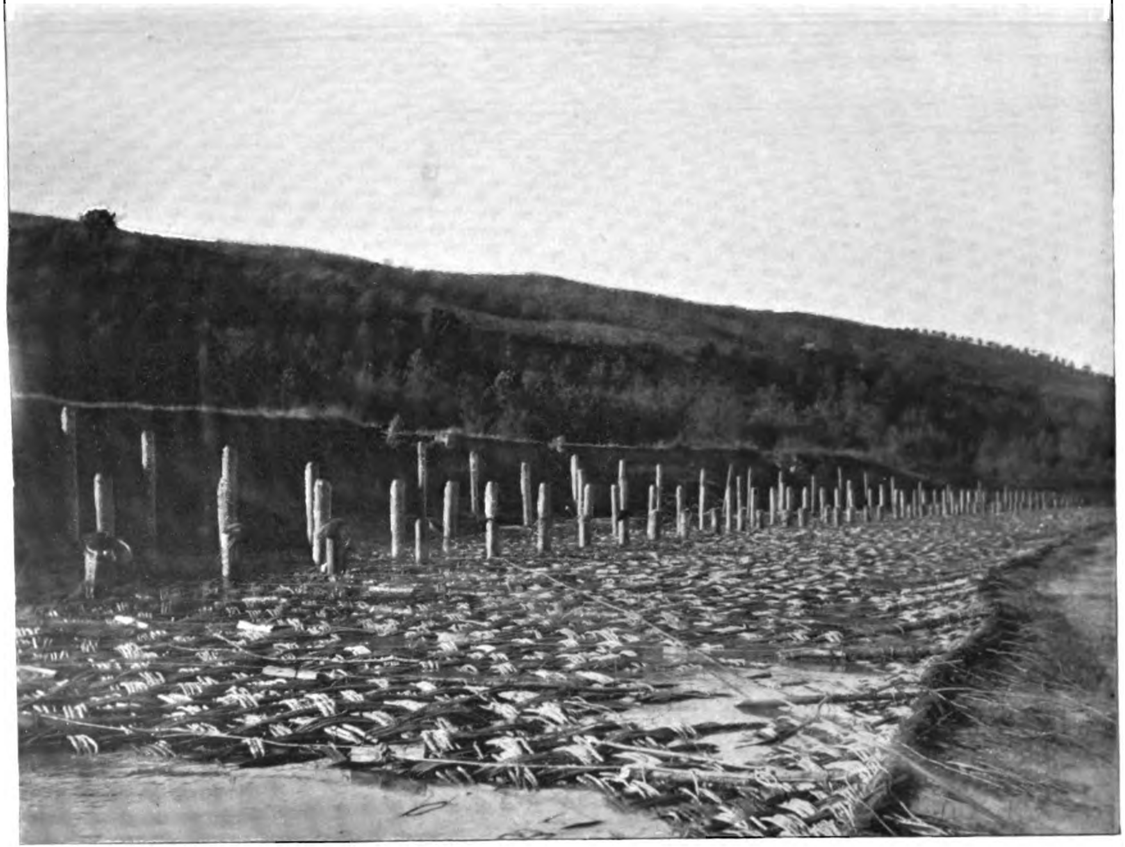
REPAIRS AT BREAK "G," BON-TON BEND. LOOKING UPSTREAM. OCTOBER 23, 1898.



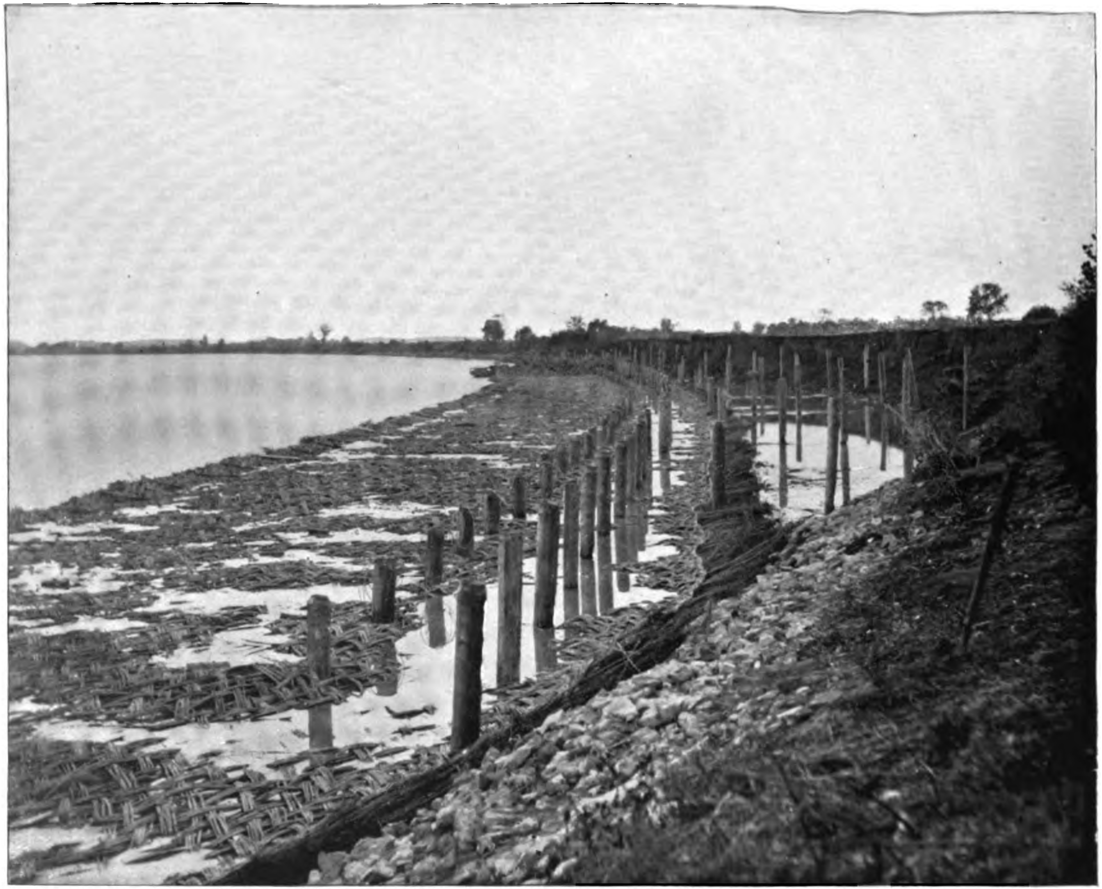
REPAIRS AT BREAK "G," BON-TON BEND. LOOKING DOWNSTREAM FROM UPPER SHOULDER OF BREAK.
NOVEMBER 30, 1898



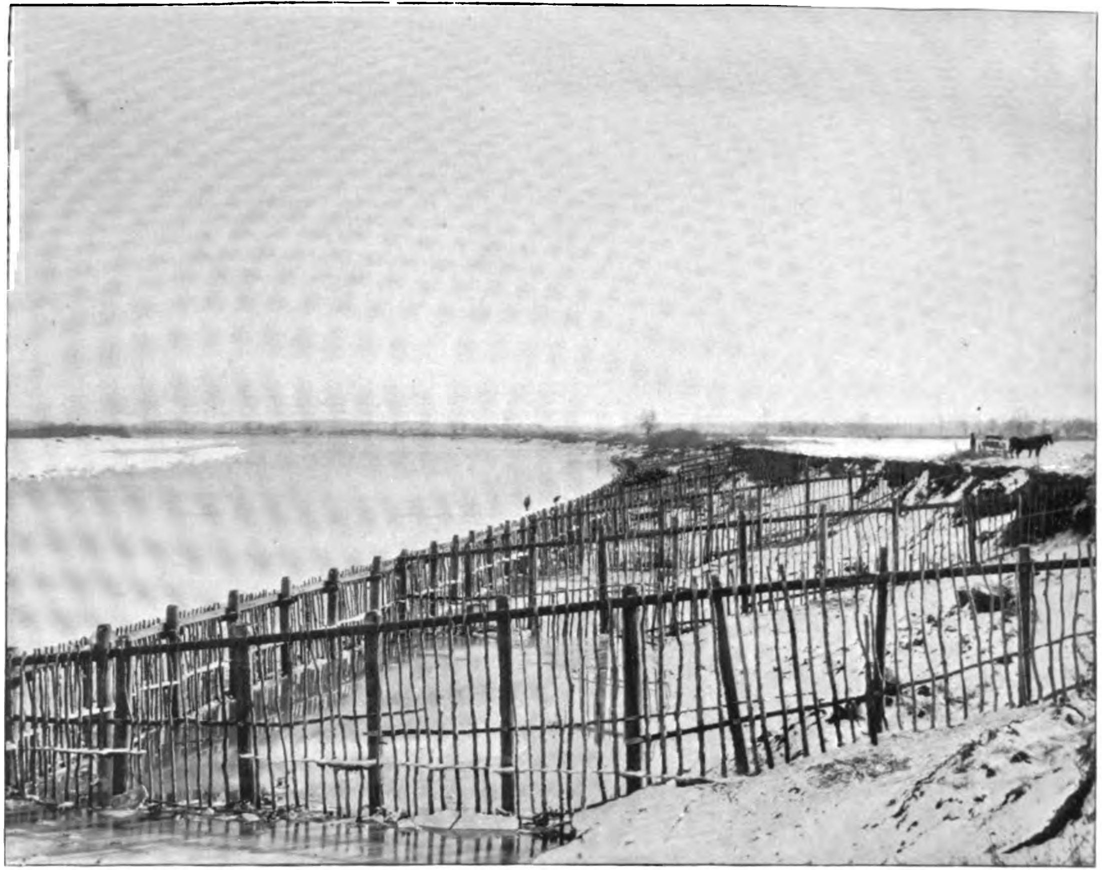
REPAIRS AT BREAK "B-C," BELMONT BEND. LOOKING UPSTREAM. OCTOBER 28, 1898.



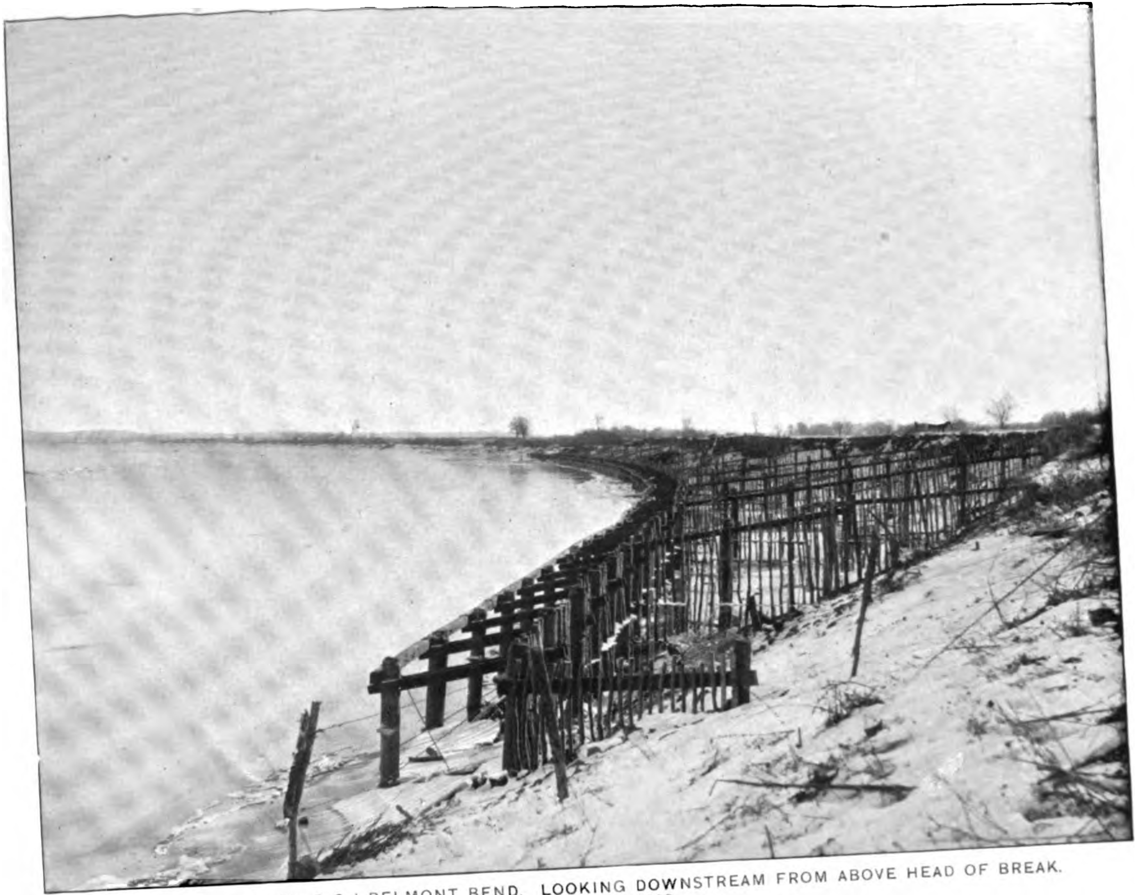
REPAIRS AT BREAK "B-C," BELMONT BEND. LOOKING UPSTREAM. OCTOBER 28, 1898.



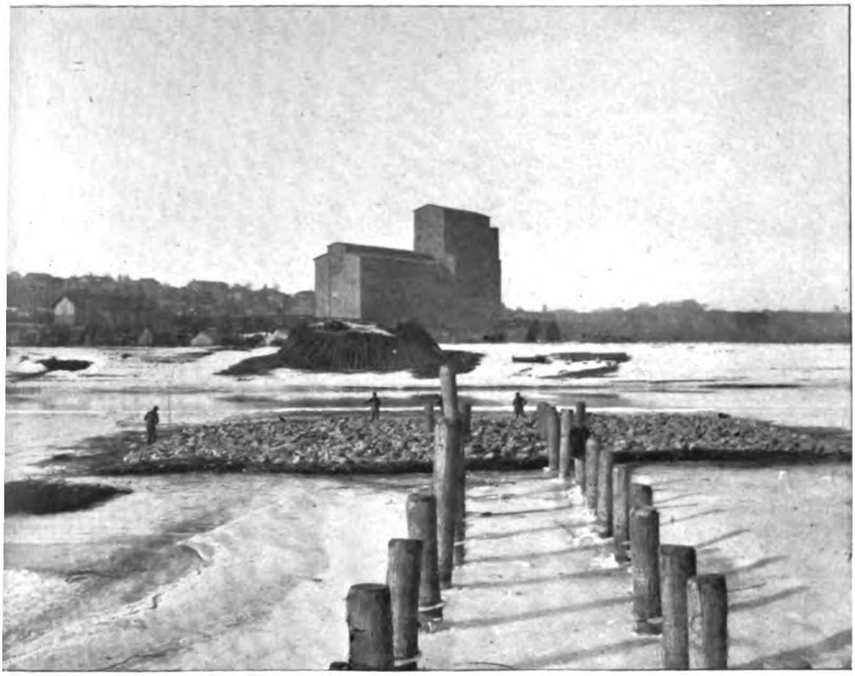
REPAIRS AT BREAK "B-C," BELMONT BEND. LOOKING DOWNSTREAM FROM ABOVE HEAD OF BREAK.
OCTOBER 23, 1898.



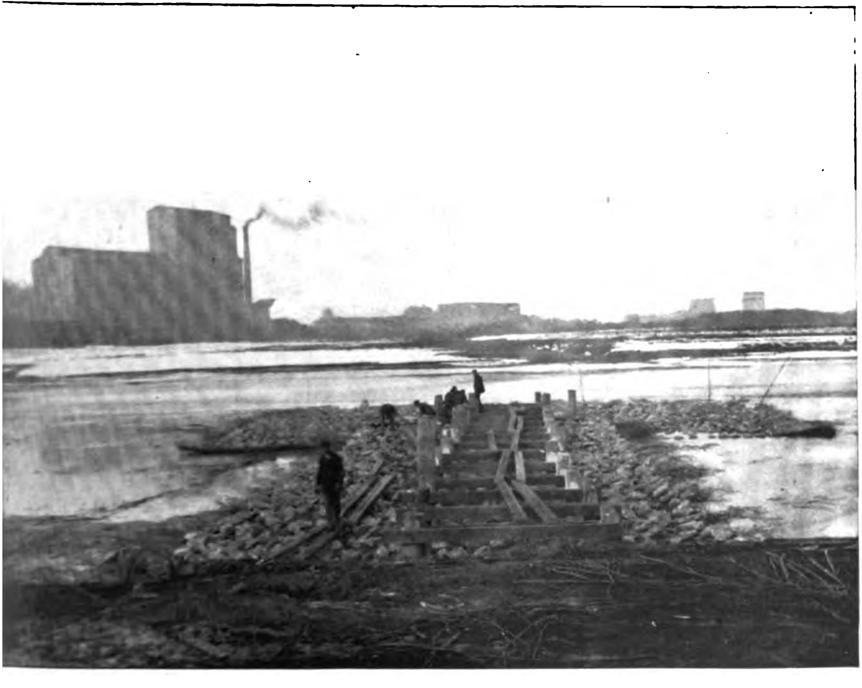
REPAIRS AT BREAK "B-C," BELMONT BEND. LOOKING DOWNSTREAM FROM NEAR HEAD OF BREAK.
NOVEMBER 29, 1898.



REPAIRS AT BREAK "B-C," BELMONT BEND. LOOKING DOWNSTREAM FROM ABOVE HEAD OF BREAK.
NOVEMBER 29, 1898.



DIKE A. VIEW SHOWING BALLASTED APRON AT STREAM END, WOVEN ON TOP OF THE ICE. PILING UNBRACED. VIEW TAKEN DECEMBER 10, 1898.



DIKE B. VIEW SHOWING BALLASTED FOOT MAT AND APRON WOVEN ON TOP OF THE ICE. PILING PARTLY BRACED. VIEW TAKEN DECEMBER 10, 1898.

against ice movements, several of which occurred before the river opened. On account also of the water being without sediment and the calking of some of the boats out of repair, considerable pumping was necessary.

The ice in the Kaw River broke up March 2, that at Kickapoo March 10, without inflicting damage to the plant. The ice gorges at Elwood also moved March 10. Some of the fields were very extensive and subjected the boats to severe pressure, by which one of the 64-foot barges, laid outside the office boat to shield it, was damaged and partly sunk, and the other, laid inside of the office boat to prevent it from being forced out on the bank, beached on the 45-degree bank.

SURVEY AND OFFICE WORK.

A low-water survey of the reach from the head of Bon Ton Bend to the foot of Belmont Bend was made by Mr. H. V. Latham. This survey was extended by Mr. Horace Dunaway, of your office, to Randolph Landing.

The notes of the above surveys were platted at this office.

I have been ably assisted in the season's operations by Mr. Morris Rosenbach in clerical work, by Mr. H. V. Latham on surveys, platting notes, and construction work, and by Mr. C. C. Wrenshall on construction work and care of plant.

The brush, cottonwood piling, and poles were procured under the supervision of Mr. J. A. Richardson.

Very respectfully, your obedient servant,

Saml. H. Yonge,
Division Engineer.

Lieut. Col. Amos Stickney,
Corps of Engineers, U. S. A.,
President Missouri River Commission.

Appendix E.

ANNUAL REPORT ON OMAHA DIVISION, BY MR. S. WATERS FOX, DIVISION ENGINEER.

Missouri River Commission,
Jefferson City, Mo., June 30, 1899.

Colonel: I have the honor to submit the following annual report of operations on the Omaha division of the Missouri River for the fiscal year ending June 30, 1899.

The report covers the time from March 18, when, as directed in your letter of March 16, I relieved Mr. Samuel H. Yonge in charge of the division to the close of the year.

Operations comprised dike construction opposite Leavenworth; some curtain work on dikes at mouth of Kaw River; revetment repairs in East Bottoms, below Kansas City, Mo., and the usual routine work, care and repair of plant and surveying, incident to carrying on river improvement works.

DIKE OPPOSITE LEAVENWORTH.

Work on this structure was commenced on the 7th of April, and after a suspension from April 19 to May 10, on account of high water, completed in practical accordance with the plans on May 15.

A description of the plan of the dike, its location, the object for which it was built, the extent and character of the work previously done on it—the construction of the surface mattress for shore extension work—are fully stated in the annual report of Mr. Samuel H. Yonge, to which I beg leave to refer.

The dike as built is of two row work, 10 feet spacing. Counting from its stream end there are 36 bents of pine piles driven to an average penetration of 25.7 feet, then there are 6 bents of yellow pine dimension piles, 6 inches by 8 inches 22 feet long doubled or reenforced with 4 by 8 inch stuff.

The shore extension from bank to the shale levee, mentioned in Mr. Yonge's report above referred to, consists of 44 heavy stakes, in bents of two, driven with mauls through the surface mattress previously made and braced with poles. Between the rows of stakes the stone ballast was piled to the height of the dike—about standard high water. The pile work was braced and tied in the usual manner and curtained full length. The foot mattress was made 45 feet wide from the shore out to Bent 28, widened to 85 feet at Bent 29 and carried at that width to a point 10 feet beyond the end bent, where it had to be dropped on account of high water. Because of the abbreviated foot mat an extra quantity—150 cubic yards of stone—was placed at the outer end of the dike as a precautionary measure against loss or damage to the structure due to scour.

The cost of this work, $3,220.88, was charged to the allotment from the appropriation for improving the Missouri River in the sundry civil act of July 1, 1898. The elements of work and cost in detail are shown in the Appendix, Exhibit A.

KAW RIVER DIKES.

The curtaining of these dikes was begun March 30, but had to be discontinued when about half completed, on account of a rise in the river which submerged the waling.

Ninety linear feet of curtaining on Dike A, and sixty linear feet on Dike B were completed.

The cost of this work, $22.06, was charged to the allotment of $5,000 from the appropriation for improving the Missouri River in the sundry civil act of July 1, 1898. It is shown in item in the Appendix, Exhibit B.

EAST BOTTOMS REVETMENT REPAIRS.

The authorized work contemplated the repair of about 770 linear feet of the old revetment near its lower end. It provided for placing a reenforce mattress about 70 feet wide the entire length of work to be repaired, the chording of the pockets in the bank by screened pile work, with cross curtains supported on posts to the bank, and the repaving of the upper bank where necessary.

An examination made just before commencing the repairs disclosed that a portion of the old work had settled so slightly that it required but a little dressing up and repaving, so that the amount of new work was reduced to 569 linear feet.

Work was commenced on the 21st of March and completed April 7.

The cost of this work, $2,597.14, was charged to the allotment for Repairs to Works and Contingencies, from the appropriation for improving the Missouri River in the sundry civil act of July 1, 1898. The elements of work and cost in detail are shown in the Appendix, Exhibit C.

PLANT.

On taking charge of the Omaha division the following pieces of floating plant were turned over to me:

One office boat and two 64-foot barges in Elwood Bend above St. Joseph, Mo.

Two small quarter boats, two 64-foot barges, and 100-foot barge that had been wintered in Kickapoo Chute, and two pile drivers and one 100-foot barge that had been wintered in the Kaw River.

On April 5 the fleet was reenforced by the arrival on the work of four 100-foot barges transferred from the fleet above Glasgow.

On the 6th of May the boilers of pile drivers Nos. 8 and 10 were inspected by the United States boiler inspector and allowed to carry a steam pressure of 100 pounds.

The steamboat service was performed by the chartered steamer *John R. Hugo*. She was in service altogether from March 18 to May 28—thirty-three and one-half days. On the latter date she arrived at Gasconade boat yard with Omaha division office boat and pile driver No. 10 in tow, and was placed on her own time in order that some much-needed repairs might be made.

The harbor in which the three hulls above St. Joseph were moored becoming unsafe on account of violent eddies and exposure to drift, the steamer *J. W. Spencer* was engaged on April 12 and moved them to a better location a short distance above. On May 15 these hulls were taken in tow by the steamer *Hugo* for Leavenworth.

An effort had been made to repair pile driver No. 10 for service while at Leavenworth, but it developed that the repairs needed would be so extensive that it was concluded best to take the apparatus to Gasconade.

Repairs to other plant on the work were of a light character, principally current repairs incident to wear and tear in service.

On account of the flood which crested on the 28th of April, at a stage of 20 feet above standard low water, it became necessary on the 18th of that month to abandon the yard at Fort Leavenworth for a harbor with a higher bank; construction work on the dike opposite Leavenworth had to be suspended, and the plant in use there gotten to a high water harbor. The place selected was on the Leavenworth side, a short distance above Union Station, and all of the plant, with the exception of one 100-foot barge, was safely moored there on the 19th.

In crossing the river with that piece, which was loaded with riprap stone, the tow lines parted and the barge was swept down and wrecked against one of the piers of the Leavenworth Bridge. The matter was made the subject of a special report.

Between the dates of May 20 and 23 all of the Omaha division plant, with the exception of two 64-foot barges and the office boat and the pile driver above referred to, was taken to Little Blue Reach for service in the restoration of Dike 2 A. The two 64-foot barges and some lumber were left at Leavenworth in care of a watchman.

SURVEYING.

The only work of this character was that involved in the proper location and construction of improvement works.

Very respectfully, your obedient servant,

S. WATERS FOX,
Division Engineer.

Lieut. Col. AMOS STICKNEY,
Corps of Engineers, U. S. A., President Missouri River Commission.

LIST OF EXHIBITS FORMING APPENDIX TO FOREGOING REPORT.

Exhibit A. Elements of work and cost in detail of dike opposite Leavenworth.
Exhibit B. Elements of work and cost in detail of repairs to Kaw River Dikes.
Exhibit C. Elements of work and cost in detail of repairs to East Bottoms Revetment.

Exhibit A.

Elements of work and cost in detail of construction of dike opposite Leavenworth, Kans., in December, 1898, and April and May, 1899.

Classification and extent.	Cost in item.	Total.
Surface mattress (252 linear feet or 6,725 square feet): [a]		
Materials and supplies—		
34 cords brush (procured by hired labor), at $1.752	$59.57	
600 feet ⅜-inch galvanized wire strand	5.02	
16 clips, at 5½ cents	.88	
$150\frac{7}{10}$ cubic yards stone, at 88 cents	132.62	
Labor—		
Weaving	56.40	
Ballasting	30.24	
Inspection	30.44	$315.17
Pile work:		
Materials and supplies—		
2,912 linear feet pine piling, at $0.177	515.42	
Labor, handling piling	49.05	
1,456 feet B. M. long-leaf yellow pine, at $20.76 per M	30.23	
Hardware, spikes, nails, etc	1.25	
63 bushels coal, at $0.094	5.97	
Labor—		
Driving 74 dike piles	112.73	
Driving 13 anchor piles	37.27	
Driving by hand and building 12 sawed piles	41.59	793.51
Foot mattress (427 linear feet equals 22,035 square feet):		
Materials and supplies—		
136 cords brush (procured by hired labor), at $2.29	311.59	
13,450 feet ⅜-inch galvanized wire strand	112.57	
437 clips, at 5½ cents	24.04	
207 cubic yards stone, at 88 cents	182.16	
$204\frac{4}{10}$ cubic yards stone, at 93 cents	190.09	
Labor—		
Weaving	318.46	
Ballasting	108.26	
Handling, barging, etc	80.55	1,327.72
Bracing (410 linear feet 2-row dike):		
Materials and supplies—		
6,472 feet B. M. long-leaf yellow pine, at $20.76 per M	134.36	
Labor, handling lumber	30.48	
2,270 feet ⅝-inch galvanized wire cable	87.17	
700 feet ⅜-inch galvanized wire strand	5.86	
178 clips, at 5½ cents	9.79	
Hardware—bolts, nails, etc	27.72	
Labor—		
Bracing	69.67	
Placing and fastening 40 stay cables	60.30	425.35
Curtain work (410 linear feet):		
Materials—		
10 cords curtain poles (procured by hired labor)	45.70	
Nails	.45	
Labor, curtaining	38.78	84.93
Shore extension (220 linear feet):		
Materials—		
2½ cords curtain poles (procured by hired labor), at $4.63	11.57	
Nails	.20	
Labor, driving stakes and fastening poles	17.83	29.60
Steamboat service:		
Hire of towboat	200.00	
470 bushels coal, at $0.094 per bushel	44.60	244.60
Total	....	3,220.88

[a] This work was done in December, 1898, while Mr. Samuel H. Yonge, Division Engineer, was in charge.

EXHIBIT B.

Elements of work and cost, in detail, of repairs to Kaw River dikes, March, 1899.

Classification and extent.	Cost in item.	Total.
Curtain work (150 linear feet):		
Materials and supplies—		
3 cords brush (procured by hired labor), at $2.48+	$7.45	
Nails	.20	
Labor—		
Curtaining	7.31	
Handling brush	7.10	
		$22.06

EXHIBIT C.

Elements of work and cost, in detail, of repairs to East Bottoms revetment, March and April, 1899.

Classification and extent.	Cost in item.	Total.
Curtain work (407 linear feet longitudinal curtains and 210 linear feet cross curtains):		
Materials and supplies—		
1,321 linear feet cottonwood piling (procured by hired labor), at $0.0328+	$43.43	
Stumpage, at $0.06+	79.50	
2,232 feet B. M. long-leaf yellow pine, at $20.76 per M	46.34	
Labor, handling lumber	12.37	
9¾ cords curtain poles (procured by hired labor), at $4.048+	39.47	
430 feet ⅜-inch galvanized wire strand	8.01	
Hardware—bolts, nails, etc	7.14	
68 bushels coal, at 10 cents per bushel	6.80	
Labor—		
Driving 41 piles	88.17	
Attaching 617 linear feet waling	38.96	
Attaching curtain poles	41.53	
		$406.72
Reenforce mattress (569 linear feet equals 44,049 square feet):		
Materials and supplies—		
215 cords brush (procured by hired labor), at $2.10	451.31	
10,980 feet ⅜-inch galvanized wire strand	82.00	
311 clips, at 5½ cents	17.11	
336⅒ cubic yards stone, at 79 cents	265.52	
Labor—		
Weaving	368.49	
Ballasting	68.21	
Handling, barging, etc	278.58	
		1,526.22
Upper bank work:		
Materials—		
15 cords brush, at $1.646	24.69	
265 cubic yards stone for paving, at 79 cents	209.35	
Labor—		
Regrading, surfacing, and repaving 10,500 square feet upper bank	108.00	
Hauling, barging, etc	215.76	
		557.80
Steamboat service:		
Hire of towboat	75.00	
314 bushels of coal, at 10 cents per bushel	31.40	
		106.40
Total		2,597.14

APPENDIX F.

ANNUAL REPORT ON GASCONADE DIVISION, BY MR. S. WATERS FOX, DIVISION ENGINEER.

MISSOURI RIVER COMMISSION,
Jefferson City, Mo., June 30, 1899.

COLONEL: I have the honor to submit the following annual report for the fiscal year ending June 30, 1899, of the operations on the Gasconade Division of the Missouri River.

The following illustrations accompany:

A map (Pl. I) of Osage Point and vicinity, showing progress of the work for the proposed new junction of the Osage and Missouri rivers.

Seven photographic views (Pls. II to VIII) of work in the vicinity of Osage Point for the new junction of the Osage and Missouri rivers.

Three photographic views (Pls. IX to XI) of completed abatis, Chamois Reach.

One photographic view (Pl. XII) showing a burr about ready for launching.

One drawing (Pl. XIII) showing location of groins at Chamois bankhead and cross sections of same.

Two photographic views (Pls. XIV and XV) of the Chamois bankhead, taken August, 1898.

A map (Pl. XVI) of a portion of the Chamois Reach, showing progressive bank recession above and below the bankhead during the twenty-six months since its construction, some float paths and velocities past the bankhead, cross sections of the river in that vicinity, and the location of two lines of abatis built during the year.

Operations during the year comprised abatis construction and repair, dike construction and repair, groin construction and other light work at the Chamois bankhead, earth excavation and embankment work, the placing of paving and scour stone for the protection of earth slopes and the removal of drift and other obstructions from the proposed waterway, as provided for in the project for the new junction of the Osage and Missouri rivers, procuring construction materials, the manufacture at the Gasconade yard of iron and wooden fastenings and frames for use on detached works, care and repair of plant, construction of new plant, surveying and the preparation of maps and other drawings, a special examination and report on some dikes built in the Missouri River by private parties on Rush Island, and miscellaneous incidental work.

The work was done in accordance with approved plans under the allotments of $75,000 and $13,500 from the appropriation for Missouri River in the sundry civil act of July 1, 1898, and the river and harbor act of March 3, 1899, respectively; these amounts, together with the balance of $1,495.94 brought over from the previous year, made the total amount available $89,995.94.

The total expenditure during the year was $69,996.29, as shown in the Appendix, Exhibit A.

NEW JUNCTION OF OSAGE AND MISSOURI RIVERS.

[See accompanying map, Pl. I.]

The approved project for bringing the two rivers together above Dodds Island and closing the chute south of the island was given in my annual report for 1897, to which I beg leave to refer.

Cut through Osage Point and embankment in Dike 19 1-2 A.—When operations were resumed September 12 for the completion of this work, it was found that the successive floods that had intervened since the suspension of operations in the latter part of December, 1897, had left deposits of mud in the cut about 5 feet deep to the south of the intercepting levee and 7 feet deep to the north of it, while the initial V-shaped ditch leading from the north end of the cut through the accretions toward the Missouri River had been filled and covered with deposits. The removal of this material was tedious and expensive. After the south end of the cut had been opened nearly to grade a quantity of the semifluid mud, estimated at 520 cubic yards, was removed by dragging with a log placed crosswise. In opening a new ditch, 800 feet long, through the deposits beyond the north end of the cut, 711 cubic yards were excavated with shovels; the other material, aggregating 46,028 cubic yards, was handled with plow and ordinary slip scrapers. The earthwork was completed in practical accordance with the plans on the 20th of November, although a small party was employed December 6 to 17, on the 21st and 22d of the same month, and again January 16 to 18, in reducing to grade a much-indurated clay shoulder at the mouth of the cut.

The following is a statement in detail of the work done:

Removing intercepting levee and wasting on ground east of cut, 1,939 cubic yards, hauled 150 feet.

Excavating from south end of cut 21,402 cubic yards and wasting in Osage River, with a haul of 326 feet. Of this amount 2,561 cubic yards were mud deposited on the floor of the cut since 1897. Excavating from north end of cut 2,340 cubic yards of mud deposited since 1897, hauled 175 feet and wasted, part on upper side of embankment and part on accretions east of the north end of the cut.

Removing 520 cubic yards semifluid mud from the floor of the cut by dragging a log placed crosswise.

Excavating from the deposits in the low-water way to north of cut, 20,347 cubic yards, and disposing of same with an average haul of 200 feet as follows: 1,988 cubic yards wasted on upper side of embankment near shore end, 14,271 cubic yards utilized in restoring to grade that portion of the north end of the embankment of 19½ A, about 375 feet in length, which had been damaged by the June rise of 1898 (this portion of the work was done between the dates of September 29 and November 20), 2,044 yards utilized in restoring to grade the lower slope and the remainder wasted beyond the end of the embankment.

In excavating the ditch beyond the north end of the cut 711 cubic yards were handled, as above stated. The top and bottom widths of ditch were 6 and 4 feet, respectively, and the elevation of bottom 3 feet above standard low water.

It was originally intended, besides paving the west slope of the cut and the lower face of the embankment, to protect them against scour at the base, during the development of the proposed waterway, by a narrow woven mattress. The approach to the cut from the Osage River was to be fixed by revetting, in the usual manner, the left bank of the river for a distance of about 675 feet. The material of which the bank is composed was found to be so hard that it was thought it would withstand erosion by any current to which it is likely to be exposed, and it was therefore decided unnecessary to revet it. It was also decided to substitute for the proposed narrow mattress at the foot of earth slopes in the cut and on the embankment a supply of loose riprap stone 69 cubic feet per linear foot, which would be free to follow down any scour that might occur. This quantity was based on a probable maximum scour of 20 feet below standard low water and an estimate that 3 cubic feet of stone per vertical foot of scour would be sufficient to cover and protect the resultant slope. Where the foot of the slope was at standard low water the scour stone was to be placed in a pile 3 feet high and 23 feet wide.

Around the outer end of the embankment of 19½ A and for a distance of 568 feet inshore the full complement of scour rock was placed, but farther along inshore the accretions were so high, and in the cut the cross sectional area so limited that it was thought best to hold some of it in reserve. The reserve stone was piled on top of the bank with such cross sectional area that the quantity on any given section is just what is needed to make the full complement of scour stone.

The paving in the cut was carried to an elevation of 15 feet above standard low water and on the embankment to the top of the slope, which averaged about 19 feet above standard low water. Preparatory to paving, the slopes were dressed with shovels true to grade. The stone work was commenced October 19 and completed December 24. In all 10,587 cubic yards of stone were disposed of as follows:

Scour stone placed in reserve pile at top of bank	634
Scour stone placed in position at foot of slope	7,105
Paving 1,176 linear feet in cut	1,017
Paving 1,565 linear feet in embankment and around end of same	1,636
Spawling pavement in cut and embankment	195

The paving extends northward from a point 600 feet north of the south corner of the United States property. From there south 715 linear feet of bank was graded to the specified slope, but not paved. See accompanying photographic views (Pls. II to V).

The construction of three cross curtains, supported on single rows of piles, between the embankment and the pile work of Dike 19½ A was commenced October 25 and completed November 26. See accompanying photographic views (Pls. V and VII). The outermost one is located at the outer end of the embankment, the two others 173 and 161 feet, respectively, farther inshore. They are built the same height as the dike, 19 feet above standard low water. There were expended in their construction 26 pine piles, 116 cords of brush, 134 cubic yards of stone, and 825 poles. The object in view in building these curtains was to cause and maintain a deposit in between the embankment and pile work of Dike 19½ A, and as they were liable to be subjected at any time to great heads of water on either side, and the poles on the main dike were fast deteriorating from age, it was thought best to reenforce them.

Between the dates of January 22 and 28 the inner and outer cross curtains and that on the intermediate main dike—566 linear feet in all—were covered with wire netting having a mesh area of about 125 square inches. The main curtain was further strengthened by ⅜-inch galvanized iron strands—three horizontal and three vertical—between each pair of bents, thus dividing that space into approximately

2½-foot squares; all strand intersections were fastened with 7/16-inch cable clips. There were expended in this work 9,027 square feet of wire netting, 5,835 linear feet of strand, and 612 cable clips.

Removal of obstructions from proposed waterway.—From October to February 25 a small force was engaged in work of this kind provided for in the project and by the latter date had completed it as far as practicable.

A large quantity of drift wood that had accumulated above Dike 19 B, some of it loose, but a considerable portion requiring to be excavated, was gathered into piles and burned. One hundred and twenty linear feet of the old foot mattress was excavated and removed. One hundred and six piles in the dike were cut off 5 to 6 feet below standard low water with the aid of dynamite. This work was laborious and expensive, the surface of the accretions being for the most part 8 feet above standard low water, necessitating an excavation at each pile of 5 to 7 feet through a tangled mass of driftwood.

In an area 30 feet wide from the edge of the scour stone and extending inshore 415 feet from the line of Dike B the driftwood was cleared away to a depth of 3 feet below standard low water. There was used in this work 883 pounds of dynamite, 70 per cent of nitroglycerin. Each charge was made of seven half-pound sticks placed at a depth 5 to 6 feet below standard low water, through a 4-inch gas pipe previously driven with a light hand drop hammer; the charges were fired in groups of 10 to 18, spaced 6 to 8 feet apart. The results were very satisfactory. This part of the work was begun December 10, but two days later had to be suspended on account of a sudden rise in the Osage River; it was resumed January 1 and completed three weeks later.

The degrading of the shore end of Dike 19 B, Osage Dam and the Osage Point revetment were completed as far as practicable, on the 25th of February. In Dike 19 B 42 piles, and in the dam, 40 piles, were cut off to grade. There were recovered from the dam 67 cubic yards of stone and from the revetment 150 cubic yards, all of which were stored on the embankment near its outer end. About 10 cords of brush and poles were removed from the dam.

Repairs to Dike 19 1-2 A.—A small settlement in the upper face of the embankment of Dike 19½ A, inshore from the protection placed in June, 1898, was repaired in July by the expenditure of 12 cords of brush and 11 cubic yards of stone.

On the 19th and 20th of March, when the river was at a stage of 8.25 feet above standard low water, some slips developed in the restored upper slope of the earth embankment, due principally to the settlement of the new earth which was then for the first time submerged. To prevent loss of the earth and further slipping a row of heavy poles spaced 5 feet apart was driven to a 6-foot penetration on the 3-foot contour, their tops being left at standard high water; a double ⅜-inch strand was strung longitudinally at the top and bottom of the poles between which brush was wattled. A layer of brush was also placed at the toe of the slope and ballasted with stone. This work was completed March 25; its total length was 229 feet. See accompanying photographic view (Pl. VIII).

On the 20th of April, when the gauges indicated that the stage of the Missouri River was about 1.4 feet higher than the Osage, some slipping developed over a length of 50 feet on the upper face of the embankment located inshore from the inner cross curtain where it had been restored with new earth. At that time there was a strong flow from the Missouri into the Osage, and it is probable that some of the loss of earth was due to flow through the curtains, but the caving was largely due to the settlement of the new earth then submerged for the first time. The caved bank was fenced in with poles and brush and the slope covered with stone after being dressed up. The April rise crested at Jefferson City on May 1 at a stage of 16.2 above standard low water, and on the following day the watchman at Osage Point reported the embankment "cutting badly." It was found on examination that 90 feet of the upper side of the embankment between the middle and outer cross curtain had sloughed, leaving a bluff face 5 feet high extending about 3 feet into the top width of the embankment; there were several cracks in the embankment and some settlement at the junctions of cross curtain with embankment; three piles in the other cross curtain had been forced out of line by the pressure due to the great head of water to which it was subjected.

A force of men was at once put to work reenforcing the bank ends of the cross curtains and in building cross fences or curtains at short intervals from the bank to the longitudinal fence built in April. Additional posts were driven in the fence above the inshore cross curtain and a wattling of brush put on. The old wattling on the fences above and below the middle cross curtain was forced down close to the bottom and made as tight as possible, to prevent the loss of any more material from the embankment, and built up with new brush to the top of the posts. The upper slope between the middle and outer cross curtains, after dressing, was covered with a thatching of brush, fastened with wire and ballasted. The outer cross curtain was reenforced with ⅜-inch strand. A hole scoured out below it by the overpour was partially filled and further scour prevented by placing in it two burrs. The cost of this work is shown in the Appendix, Exhibit B.

The first flow through the cut in Osage Point occurred December 23 and continued three days during a rise in the Osage River. The flow through the ditch north of the cut was estimated at 15 to 20 second-feet. The rise was of short duration and the difference in heights of the two rivers so small that there was no enlargement of the ditch; in fact, some material that sloughed in from its side slopes proved too heavy for transportation by the current and reduced the volume of discharge. In several subsequent rises the relative stages of the two rivers were so nearly equal that deposits were left in cut and proposed waterway. Whether or not the proposed waterway will be developed by a flood from the Osage, as contemplated in the project, has not been fairly tested, as the Osage has been in flood but once since the cut was opened, and then when the Missouri was at a correspondingly high stage.

OTHER DIKE WORK.

Repairs to Dike XXIII.—A breach 266 feet long in this dike, first noticed August 12, is believed to have been caused, during the preceding flood, by one of the condemned 100-foot barges, the wrecked hull of which was found later on lying on the bar below.

The work of closing the breach was commenced October 6 and practically completed by the end of that month, when operations had to be suspended on account of a rise in the river. It was taken up again November 3 and completed two days later.

In all 113 piles were driven, of which 10 were for anchorage. Of the dike piles, 63 were cottonwood and 40 long-leaved pine, driven to an average penetration of 23.2 feet. The foot mattress was 17,280 square feet in area, requiring the expenditure of 123 cords of brush and 107 cubic yards of stone ballast. The usual bracing and curtain were attached. In order to avoid the deep water in the breach, an offset 50 feet upstream was made in the line of the dike. The new work was equivalent to 347 linear feet of 3-row dike.

The cost of these repairs is shown in detail in Appendix, Exhibit C.

Degrading Dike XVI A.—A small force was employed from the 1st to the 3d of December in removing the drift accumulated at the outer end of Dike XVI A and in cutting down the outer 54 feet of the dike to a grade rising from 0.3 foot to its old grade of 7.9 feet above standard low water. The cost of this work was $56.38.

Construction of Dike XXIV.—The piles in this dike driven in 1896 had never been braced, and authority was given for attaching braces to those piles now on the shore bar formed by them. Between the dates of November 25 and 29 braces were attached to 15 bents on a grade that falls from 13.9 feet above standard low water at the shore to 12.4 feet above at the outer end. The cost of this work was $185.17.

Dike XI B.—In order to fill a deep hole at the outer end of the dike, which exerted an objectionable influence on the alignment of flow in the reach below, a groin was projected to extend across the hole a distance of 108 feet on a line, making an angle of 30 degrees upstream with the line of the dike, its inner end to have the same elevation as the foot mattress of the dike, 15.5 feet below standard low water, and to slope to 20 feet below at the outer end.

Work was commenced April 1 and suspended on the 8th of the same month, after placing 35 burrs and one gabion. Soundings at the time indicated that a groin had been formed on the proposed line extending 83 feet beyond the end of the dike the top surface of which was 25 to 30 feet below standard low water. The burrs were in all respects like those used in constructing two groins at the Chamois bankhead and described under the chapter on bankhead. The gabion, as the name implies, was a hollow cylinder of brush work 10½ feet diameter by 30 feet long, stiffened against crushing by five frames of sawed stuff held together by wedged oak pins. The ends of the gabion were closed with brush and three brush partitions were introduced to insure the even distribution of the 10 cubic yards of stone used to sink it. The cost of the groin was $369.46.

ABATIS CONSTRUCTION.

Abatis from south bank of Hardins Island.—In a letter dated September 16 you directed the construction of a line of abattis 500 feet long from a point on the south shore of Hardins Island about opposite the foot of the Chamois revetment. See accompanying map (Pl. XIV).

The work was commenced October 29 and completed November 20. It was built in accordance with the plans given in my last annual report, except that instead of imbricating the sections downstream, as was done last year, each section was placed in line end on to the one next to it.

The object in view in building the abatis was to eliminate the Hardins Island crossings, and thereby give a better approach to the bankhead below. While this result was not fully realized, the conditions were greatly ameliorated.

At the time the abattis was built the average elevation of bottom on line of the structure was 8 feet below standard low water and the stage 0.65 foot below standard low water. When last sounded in April the bottom appeared to have raised 5.2 feet, or about to the level of the top waling piece which supports the poles. The poles seemed all to have been broken off at the wale. The fill below the abatis was more marked and quite extensive. The cost of the work was $1,194.81, or an average of $2.3896 per linear foot. The accompanying photograph (Pl. IX) shows the structure as it appeared December 4, soon after the completion.

Abatis across chute above Hardins Island.—The extension of the line of abatis built in October, 1897, across the chute to the 5-foot contour of the island next above Hardins Island was commenced November 18, and after a suspension of four days on account of running ice and a sudden rise in the river, was completed December 3. The length of this work was 657 feet. A small force was kept employed two days longer in extending the line, on a modified plan, 153 feet farther to the 8-foot contour. During the April rise this part of the work—153 linear feet—was scoured out and swung down out of line. The other parts, both new and old, stood well, and have caused considerable deposit to form below. The cost of the new work was $1,310.74, or $1.6182 per linear foot. See accompanying photographs (Pls. X and XI).

ABATIS REPAIRS.

Hardins Island abatis (south shore).—A flow through the abatis at the shore caused a slight scour, and the strains produced in the framework, due to bridging the holes thus formed, ruptured one or two of the members. Repairs were made on the 15th of January by filling underneath with brush and driving in two rows of poles across the cut. The cost of these repairs was $21.32.

Abatis across chute above Hardins Island.—A length of 24 feet of the old abatis, where it joined the new work, settled from 1 to 3 feet, due to scour. On the 19th of January this part of the line was restored to grade with an inclined screening of poles. The cost of these repairs was $21.07.

BANKHEAD.

Chamois Bend.—This structure, the first of its kind, built in March, 1897, has withstood remarkably well the attacks of the river. Besides some light and inexpensive work in the way of dressing up the upper cone, removing driftwood from the berm and cutting off to grade—December 12 and 13—some 57 piles in the outer wall, a number of which had been left for convenience in mooring plant, the only work done during the year was the construction between the dates of March 14 and 27 of two groins on radials 30 degrees and 41 degrees 27 minutes above the middle ordinate. See accompanying plate (Pl. XIII). There were used in this work 13 cords of poles, 73 of brush, and 264.8 cubic yards of stone. These materials were made up for expenditure in the form of a device called a burr, 80 of which were placed in the lower groin and 72 in the upper one. A photograph of a burr about ready for launching accompanies (Pl. XII). This device is made by weaving brush on a framework of native sawed lumber. The framework is put together with wedged oak pins and the brush woven on it in such a manner that metal fastenings are avoided and a structure secured that is at once strong, durable, of maximum size for materials used, and inexpensive. It is estimated that one burr in place occupies 400 cubic feet. The following is an average bill of cost of a burr:

Materials:	
Lumber	$1.26
Brush and poles, 17/30 cord	1.12
Stone, 1.6 cubic yards	1.60
Wire, No. 18, 4 pounds	.11
Labor:	
Construction of burr	2.89
Launching	1.27
Steamboat service	1.45
Total	9.70

The groins were built as closely as practicable to the following grade lines: Starting 6 feet below standard low water at the piles in outer wall of bankhead, slope down 1 foot in 25 feet to the bottom of the river. As built the upper one extended 156 feet beyond the post circle and the lower one 152 feet. The cost of this work was $1,536.16, as shown in detail in the Appendix, Exhibit D.

The object of the groins was to fill up the trench around the bankhead and prevent its formation again during flood or comparatively high stages; or, in other words, to hold in check the opposite reef and thus relieve the engorged conditions due to a situation in which the only unyielding element was the bankhead. The first action of the groins was favorable; a fill of from 2 to 5 feet above and below was indicated, but later on the fill was lost and a general scour took place above, between, beyond, and below the two groins. When last sounded there was a settlement of the groin indicated of 6½ to 10 feet, and this fact and the stage of the river at that time, 9.25 feet above standard low water, may have been important factors in the results noted.

Early in August an examination of the Chamois reach disclosed the presence of a large submerged bar, which headed up in the locality of the foot of Chamois revetment and extended down past the bankhead. This bar divided the volume of discharge about equally, so that at the time it appeared that but 50 per cent or less of volume of river passed the bankhead. It was roughly estimated that 10 per cent passed to the north of Hardins Island. In September the left-hand way became the steamboat channel and carried considerably more water than the chute past the bankhead. These conditions prevailed for some time, but were largely corrected by the abatis. There is still something of a middle ground in the reach, from the new to the old mouth of Greasy Creek, which is an objectionable feature, but it is not pronounced and the approach to the bankhead has for some time been favorable.

PROCURING CONSTRUCTION MATERIALS.

The brush, poles, and stone used during the year were procured by hired labor, or from storage piles left over from last year's work. Other materials—piling, lumber, strand, etc.—were acquired by purchase in the usual manner, or from stock on hand at the supply yards at Bonnot's Mill and Gasconade.

Brush and poles.—For use in dike repairs and groin construction—Dike XI B and Chamois bankhead—and for construction of abatis, 369 cords of brush and poles were gotten out by small parties, as required.

The brush and poles used for the construction of cross curtains in Dike 19½ A, in November and later on in May, for reenforcing them, were gotten from the supply on hand left over from last year, excepting 42.5 cords which were cut just prior to expenditure.

The cost of these materials procured during the year was $874.69.

Stone.—A force of men employed in the Osage Point quarry from October 8 to December 24, produced 2,112 cubic yards of stone. This, together with 8,268 cubic yards quarried in 1897 and left in the quarry, a storage pile on the Osage River bank, containing 432 cubic yards, and 217 cubic yards recovered from Osage River dam and revetment, in the aggregate 11,029 cubic yards, were disposed of during the year on Osage Point work.

For use in dike repairs and groin construction—Dike XI B and Chamois bankhead—and for construction of abatis, 70 cubic yards were taken from storage piles at the mouth of Moreau River, 210 cubic yards from storage pile in Osage Point quarry, and 268.6 cubic yards from the Little Tavern quarry.

PLANT.

Towboat service.—During the year the following steam tenders were in service: *Arethusa*, *Atalanta*, *Sabrina*, *Melusina*, and *Harry*. In the order named they were in service twenty-eight, twenty-six, forty-three, nine, and twenty-two days, respectively.

They were employed in moving plant and materials and assisting on construction work at Osage Point, repairing Dike XXIII, constructing abatis at Hardins Island, moving plant from Lock No. 1, on Osage River, to the boat yard, and shifting plant on the Gasconade yard front and in the Gasconade River harbor.

Machine boat.—A force was employed on this boat as required to meet the current demands of the plant repair work at the Gasconade yard and in filling extensive orders sent from detached field works for bankhead and dike bolts, clips, staples, and other fastenings.

For convenience and economical operation the machine boat was pulled out October 2 and placed on blocking in the yard, just eastward from the yard blacksmith shop.

Repairs to yard plant.—The storage and launching ways were repaired only where indicated during the process of pulling out and launching the boats.

The entire stock of wheelbarrows, shovels, pulling blocks, and many of the smaller tools were overhauled and repaired.

The machine boat, mill, and the boilers to yard pulling engines were inspected by the United States boiler inspector.

Repairs to floating plant.—The following pieces were overhauled and put in serviceable condition: Towboat *Alert*, steam tenders *Arethusa*, *Atalanta*, *Melusina*, *Sabrina*; the small stern wheel tender *Harry*; and gasoline launch *Enquirer*; 24 100-foot barges, 7 64-foot barges, 2 hydraulic graders, 5 mattress boats, 4 pile drivers, 2 large quarter boats, 3 small quarter boats, 1 office boat, 3 cross boats, and 1 cross boat with cabin was transformed into an ice boat. Of the above plant 31 pieces were overhauled on the storage ways at Gasconade and launched.

The boilers on steam tenders *Arethusa*, *Melusina*, and *Sabrina*, and on pile drivers Nos. 2, 4, 5, and grader No. 7, were inspected by the United States boiler inspector.

The cost of plant repairs during the year was $18,402.94, as shown in item in Exhibit E.

Condemned plant.—On May 27, 9 barges, 1 hydraulic grading boat, 15 skiffs, 2 yawls, a large number of subsistence utensils, tools, and other small articles were inspected and condemned by Col. John W. Barlow, Corps of Engineers, United States Army.

Loss of barges.—During the year three hulls in the Gasconade River, which were unserviceable and in an advanced stage of decay, were abandoned and allowed to sink, as they could not be profitably kept afloat.

Care of plant.—The greater part of the floating plant, 36 hulls, was harbored during the winter in the Gasconade River against the right bank, between the Missouri Pacific Railway Bridge and its mouth, and only such hulls were pulled out on the ways at the yard as were in need of repairs or in danger of sinking.

There were pulled out on the ways steamers *Golden Gate* and *Alert;* steam tenders *Arethusa*, *Melusina*, *Atalanta*, and *Sabrina*; machine boat, one 100-foot barge, one derrick boat, and two small barges, the last three hulls belonging to the Osage River plant.

New plant.—Plans and specifications with bills of material were prepared in your office for twelve new 100-foot barges. It is proposed to build these barges by hired labor in the Gasconade boat yard. The bill of iron has been delivered, but on account of some misunderstanding of the specifications for fir lumber by the contractor, and because it was found necessary to reduce the lengths of the oak required, none of the lumber has been delivered. Some preparatory work in the way of clearing up yard room and way surface was done. This involved the removal of several hulls and a number of piles of stock lumber.

A considerable part of the iron fastenings has been worked up.

SURVEYING.

In addition to the work of this kind ordinarily involved in constructing river improvement works, the following was done:

Between the dates of September 9 and 20, a hydrographic survey of Gasconade River was made from its mouth to 1¼ miles upstream, with a view of determining its fitness for a winter harbor for floating plant. A chart of the reach to a scale of 1 inch equals 100 feet was prepared, showing contour of bed and banks for each foot of depth.

A hydrographic survey was made at Dike 16 A, November 15 to 18, for study, in connection with previous surveys, of the action of the stone groin built there in April and May, 1896. The chart developed from the survey indicated considerable scour along the upper side of the groin at its outer end and below, as well as a general lowering of its surface. To what extent the pile work of Dike 16 A and the accumulated drift contributed to the results noted is conjectural, and it was with a view of eliminating that influence that the drift was removed and the grade of the dike lowered.

A chart developed from a survey made November 28 and December 1 showed the character and extent of a break in the Murrays Bend Revetment, near the head of that work.

From December 21 to 23 and January 21 to 26 the topographic survey of vicinity of Osage Point was made from the accompanying chart (Pl. I), was developed.

During the same month, 10th to 15th, a hydrographic survey of Chamois Reach was made. Again in March 29 to 31, in April 14 to 17, May 1 to 3, and from the 23d to the 25th of the same month, soundings were made on bankhead radials and on a number of ranges above and below the structure for study of the conditions of flow. The last survey included a set of time-float observations, the results of which are shown on the accompanying chart (Pl. XVI).

On May 8 and 9 a special shore-line survey with soundings was made of the vicinity of Dike 33 B, with a view of showing the situation there due to the flanking of the dike by the recession of the bank.

SPECIAL EXAMINATION AND REPORTS.

Rush Island Dikes.—In compliance with instructions contained in your letter dated April 17, a special examination was made May 16–18, by Asst. Engineer O. H. B. Turner of some dikes on Rush Island that had been built by resident land owners. His report in the matter was submitted with mine dated May 20. It appeared from the facts that while the provisions of section 9 of the river and harbor act approved March 3, 1899, had been violated, no injury had been done to the interests of navigation or river improvement. The dike at the head of the island, about which the complaint was made that instigated the examination, has since been destroyed and swept away by the river.

DAMAGES TO WORKS.

Murrays Bend Revetment.—A slight break in the Murrays Bend Revetmen its head was made the subject of a special report dated February 8, with alter projects and estimates of cost for repair.

Dike 33 B.—The flanking of Dike 33 B by recession of the right bank and th mation of a channel way between its shore end and the bank was made the s of a special report dated May 12. The report was accompanied by a chart sh shore-line approaches and a profile of bottom on line of dike, as developed fro vey of May 8 and 9. In view of the small amount of funds available for wo Gasconade Division, no remedial measures were taken; the right bank contin recede and in a short time the entire dike was destroyed. The loss of the dik be regretted, not only from a consideration of its cost of construction. It play important part in maintaining stability in the reach below, which has been imp at great expense.

Dike 17.—Some time in November a breach near the outer end of this dik noticed. There was a gap of about 150 feet in the structure, extending inshor the three outer bents.

An examination on June 16 of the reach from Jefferson City to the mouth o conade River disclosed no other loss or damage to works not previously rep except that the lower dike of the system above Cote Sans Dessein (Dike No. 2 been shortened somewhat by loss at its stream end. The Chamois bankhea peared to be in good condition. There was a swift flow over its berm and a but mild eddy at the upper end of the structure. There was no bank caving or below it.

Very respectfully, your obedient servant,

S. WATERS FOX, *Division Engi*

Lieut. Col. AMOS STICKNEY,
Corps of Engineers, U. S. A.,
President Missouri River Commission.

LIST OF EXHIBITS FORMING APPENDIX TO FOREGOING REPORT.

Exhibit A.—Classified statement of money expenditures during the year.

Exhibit B.—Elements of work and cost in detail on account of New Juncti Osage and Missouri rivers.

Exhibit C.—Elements of work and cost in detail of repairs to Dike XXIII.

Exhibit D.—Elements of work and cost in detail of construction of two gro Chamois bank head.

Exhibit E.—Expenditures on account of plant during fiscal year.

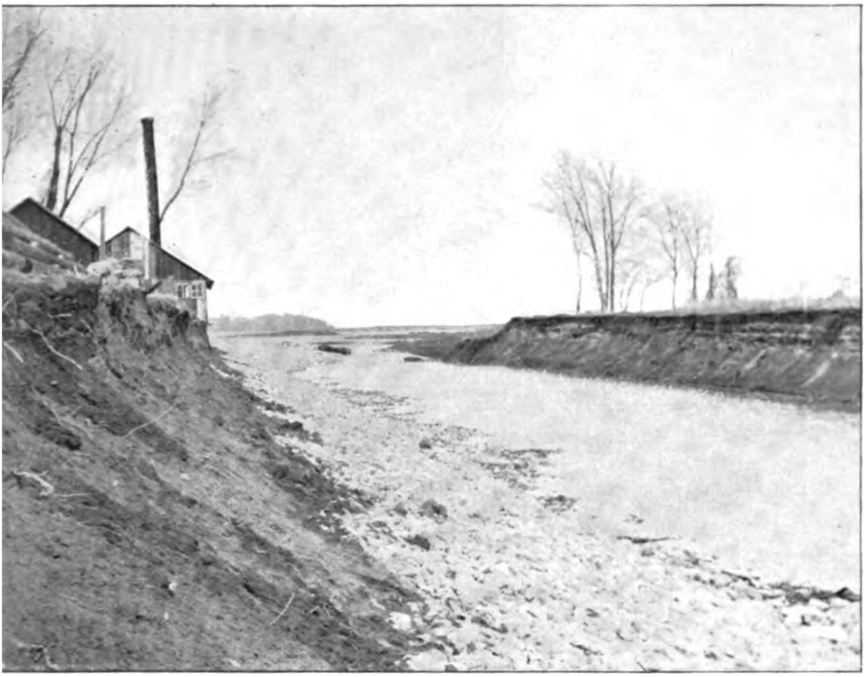
EXHIBIT A.

Classified statement of money expenditures, allotment for First Reach, during fisca ending June 30, 1899.

Classification.	Cost in item.	T
Actual expenditures on account of construction work for labor and materials..	$35,664.87	
Towboat service while directly engaged in construction........	3,045.41	
Total, about 55 per cent of total expenditure........	....	$38
All other plant service, including repairs, watching, moving from place to place, new plant, etc., about 28 per cent of total expenditure........	....	19
Administration charges, Jefferson City and field offices, about 11 per cent of total expenditure........	....	7
All other charges:		
Surveys........	1,057.42	
Telegrams........	132.07	
Traveling expenses........	690.35	
Freight charges (including charges for shipping excavating plant, Osage, Mo., to St. Louis, Mo.)........	1,048.95	
Office and ground rent, gas bill, etc........	706.12	
Total, about 6 per cent of total expenditure........	....	[illegible]
Total expenditure for fiscal year........	....	6

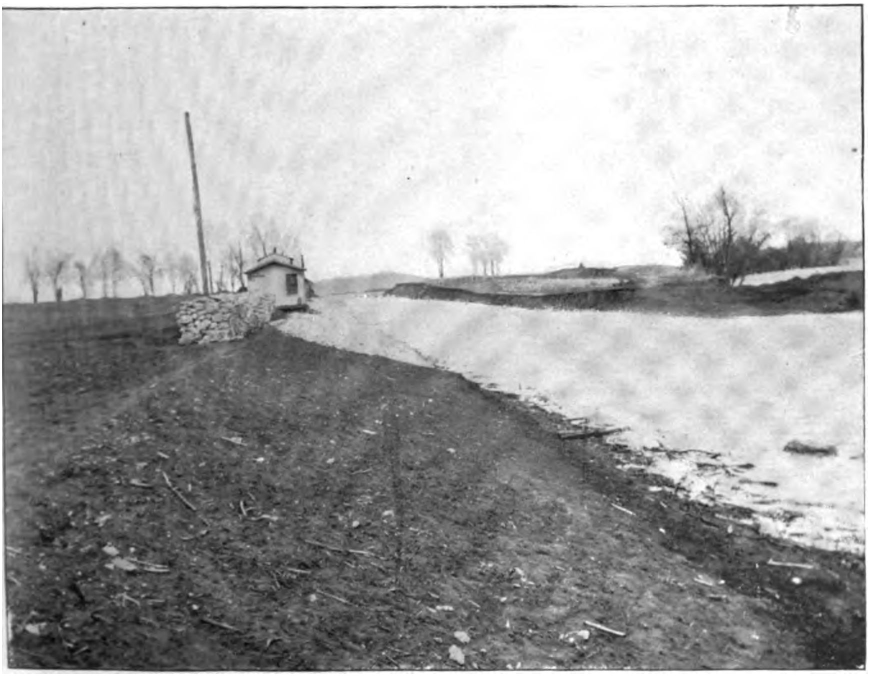
NOTE.—The cost value of materials acquired and paid for during previous year and left over for work in current fiscal year do not appear. They are inc in the cost exhibits for the special works on which they were expended.

MISSOURI RIVER COMMISSION, GASCONADE DIVISION, OSAGE POINT. PLATE II.

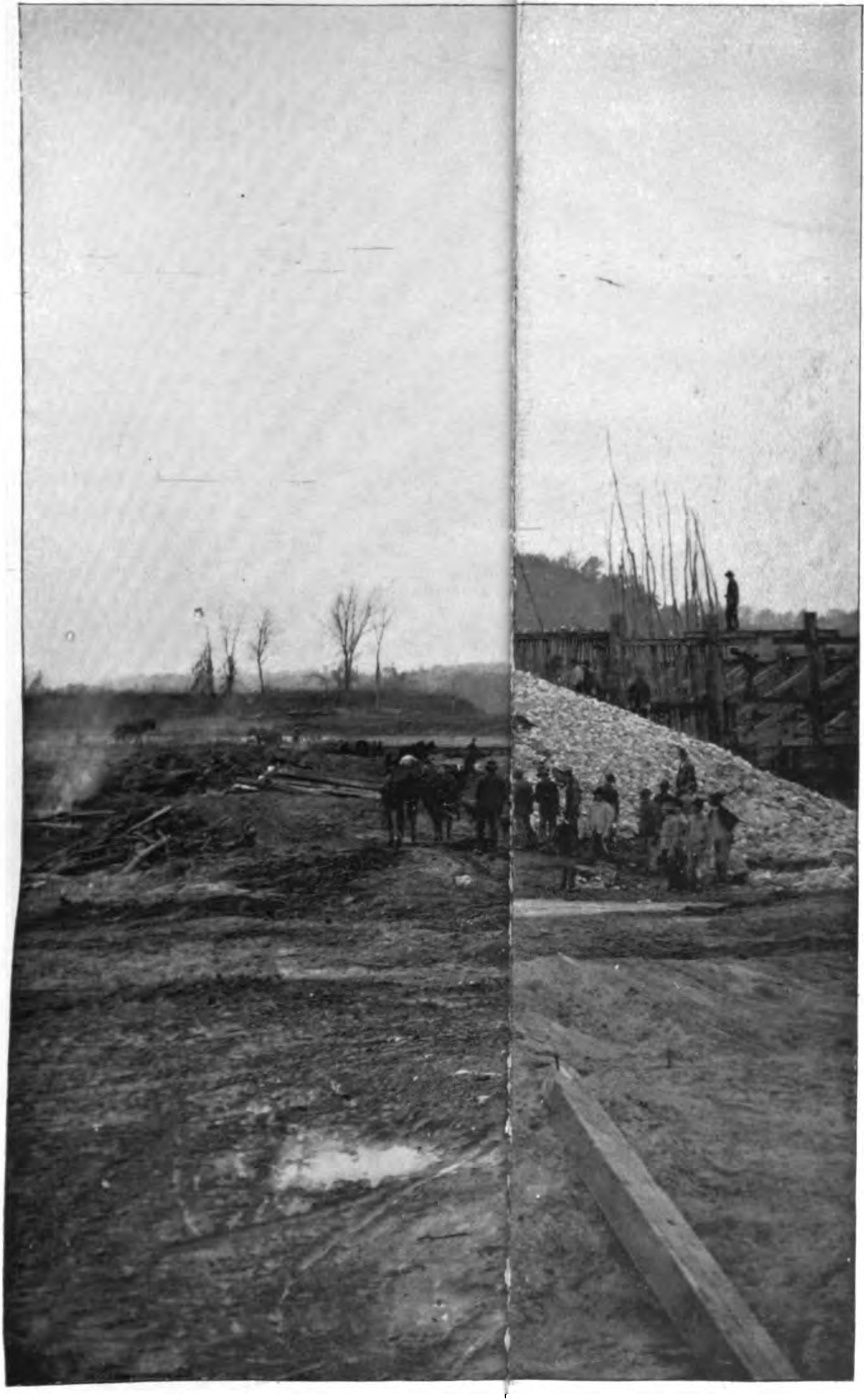


CUT THROUGH OSAGE POINT. VIEW LOOKING NORTH THROUGH CUT, TOWARD COTE SANS DESSEIN, FROM POINT ON MAIN BANK 200 FEET SOUTH OF NORTH END OF CUT. STAGE 8.5 FEET ABOVE S. L. W. VIEW TAKEN MARCH 20, 1899.

MISSOURI RIVER COMMISSION, GASCONADE DIVISION, OSAGE POINT. PLATE III.

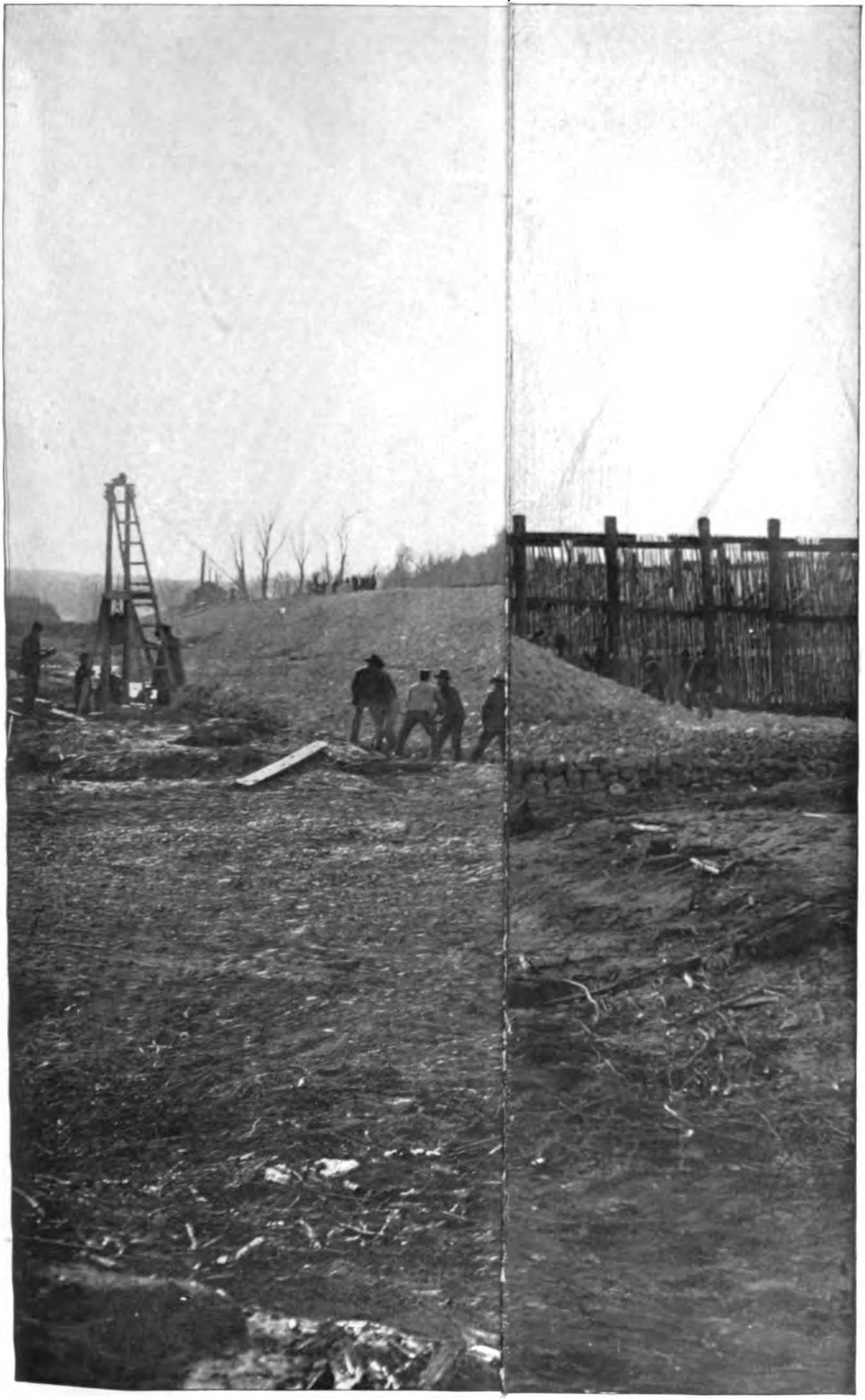


CUT THROUGH OSAGE POINT. VIEW FROM POINT ON LEFT BANK OSAGE RIVER, ABOUT 200 FEET SOUTH OF ITS ENTRANCE, LOOKING NORTH THROUGH CUT. STAGE 8.25 FEET ABOVE S. L. W. VIEW TAKEN MARCH 20, 1899.

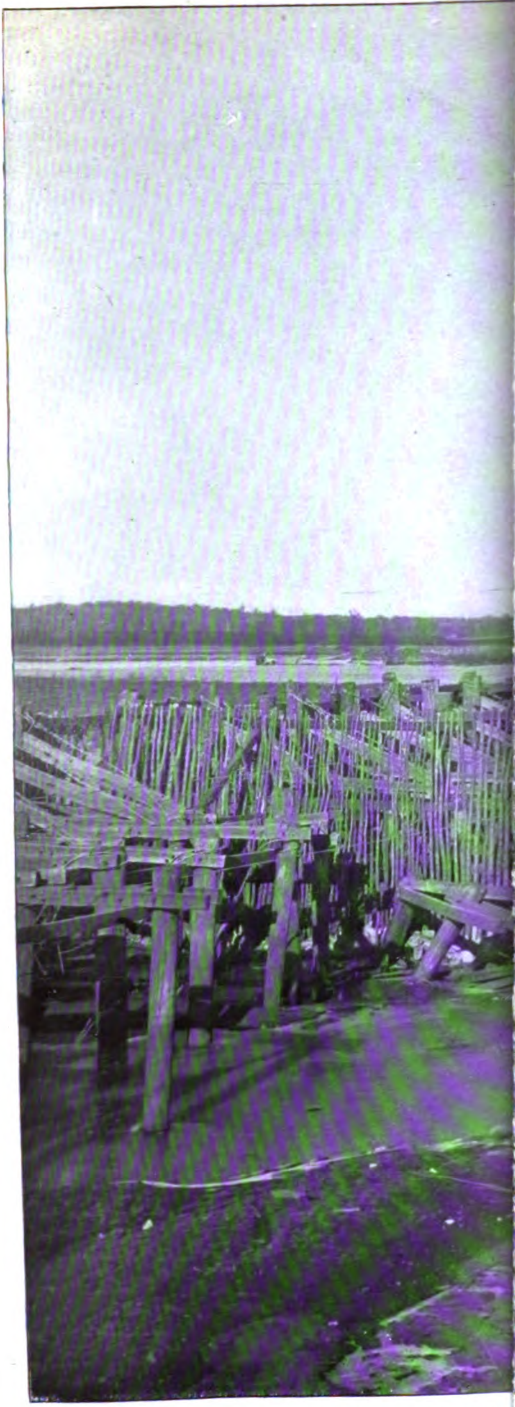


DIKE 19½ A. FROM A POINT IN PROPOSED LOW END OF EMBANKMENT. SHOWING CONSTRUCTION PARTIES R 12, 1898.

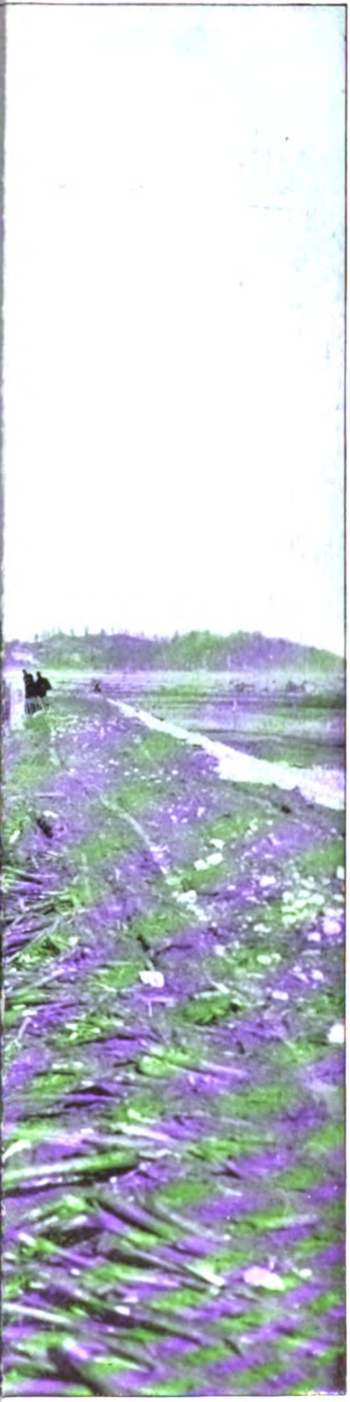
PLATE V.



DIKE 19½ A. LOOKING TOWARD THE CUT THROUGH 19½ A. PARTY AT WORK WITH HAND
PILE DRIVER PREPARING DYNAM ECEMBER 10, 1898.

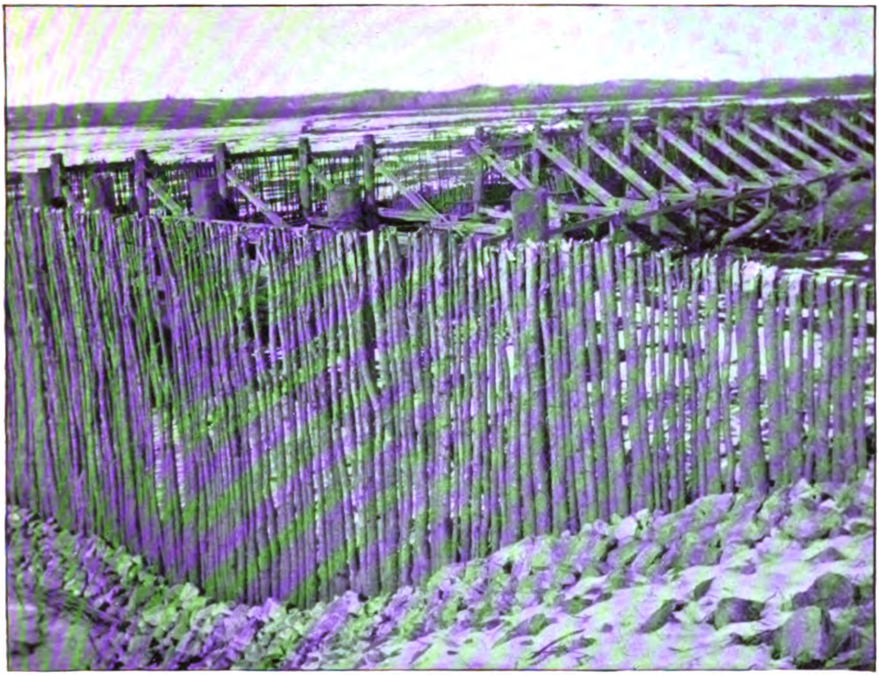


DIKE 19½ A. LOOKING TOWARD STREAM END



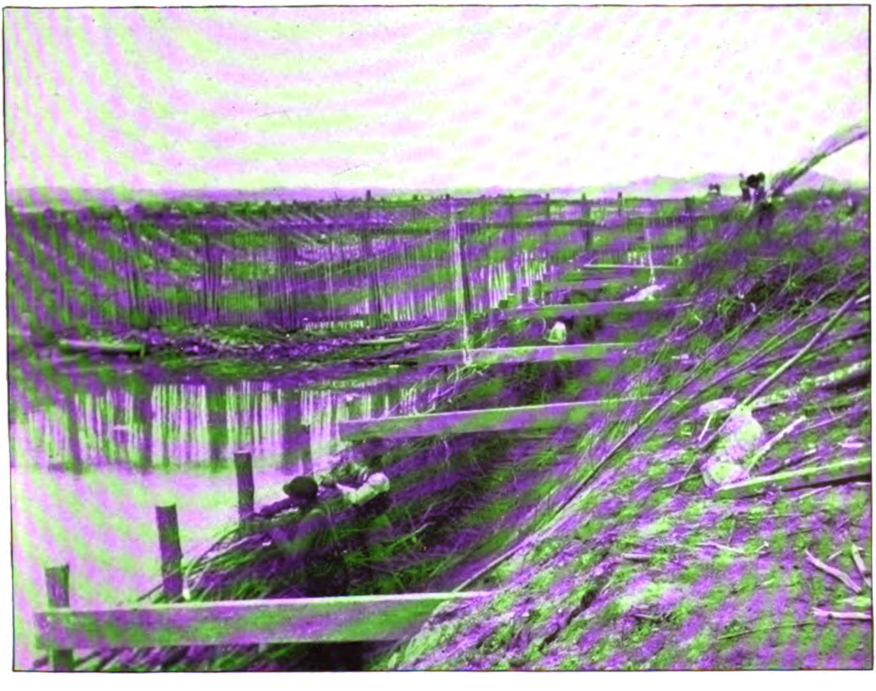
DIKE 19½ A. FROM A POINT ON
EMBANK

MISSOURI RIVER COMMISSION, GASCONADE DIVISION, OSAGE POINT. **PLATE VII.**



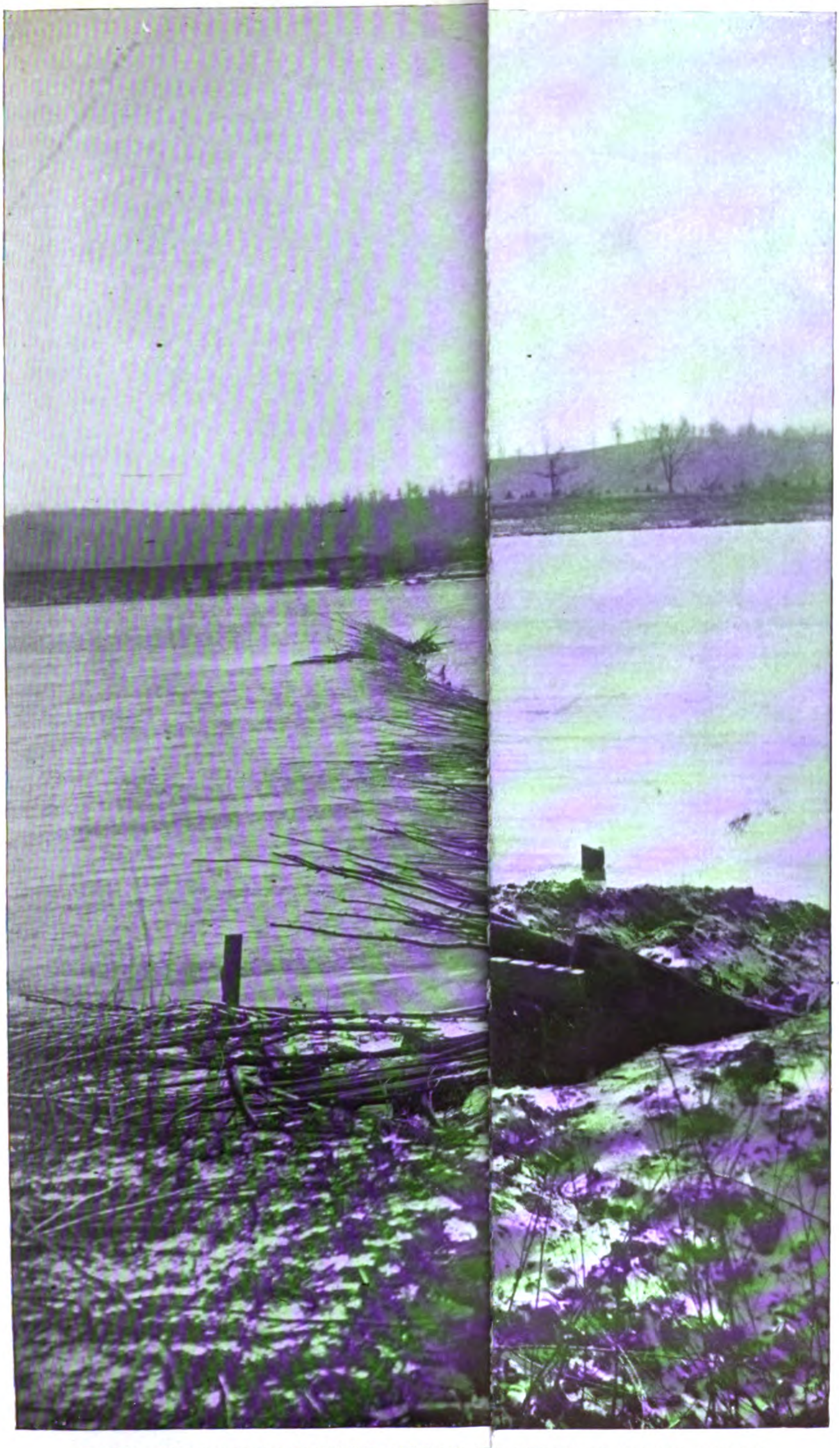
DIKE 19½ A VIEW OF OUTER CROSS CURTAIN BETWEEN EMBANKMENT AND ADJOINING PILE WORK FROM POINT ON EMBANKMENT LOOKING NORTH. STAGE 2 FEET BELOW S. L. W. VIEW TAKEN FEBRUARY 15, 1899.

MISSOURI RIVER COMMISSION, GASCONADE DIVISION, OSAGE POINT. **PLATE VIII.**



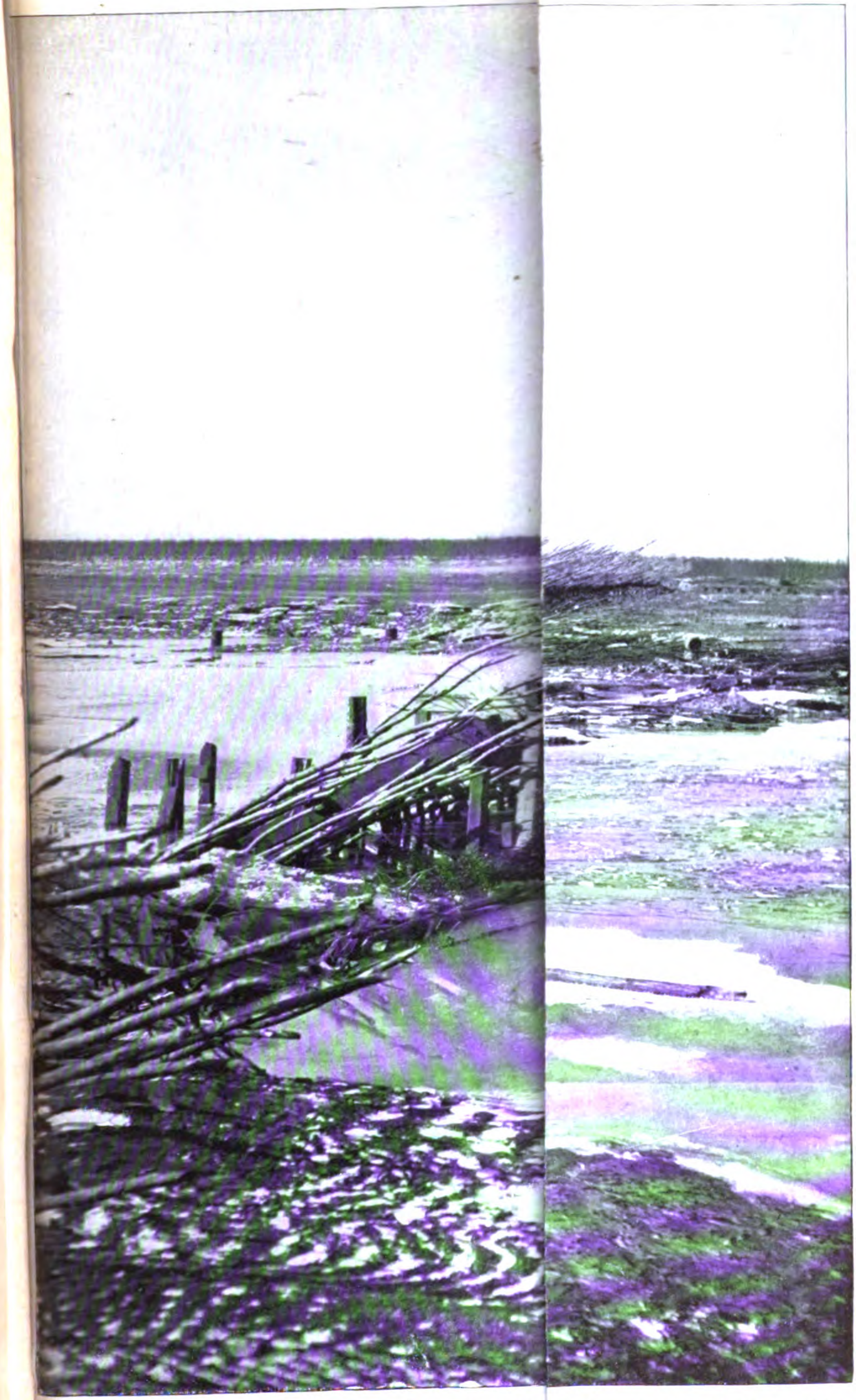
DIKE 19½ A. VIEW FROM POINT OF EMBANKMENT 30 FEET BEYOND INNER CROSS CURTAIN LOOKING NORTH, SHOWING WATTLED FENCE FOR PROTECTION OF UPPER FACE OF EMBANKMENT. STAGE 3 FEET ABOVE S. L. W. VIEW TAKEN MARCH 25, 1899.

PLATE IX.



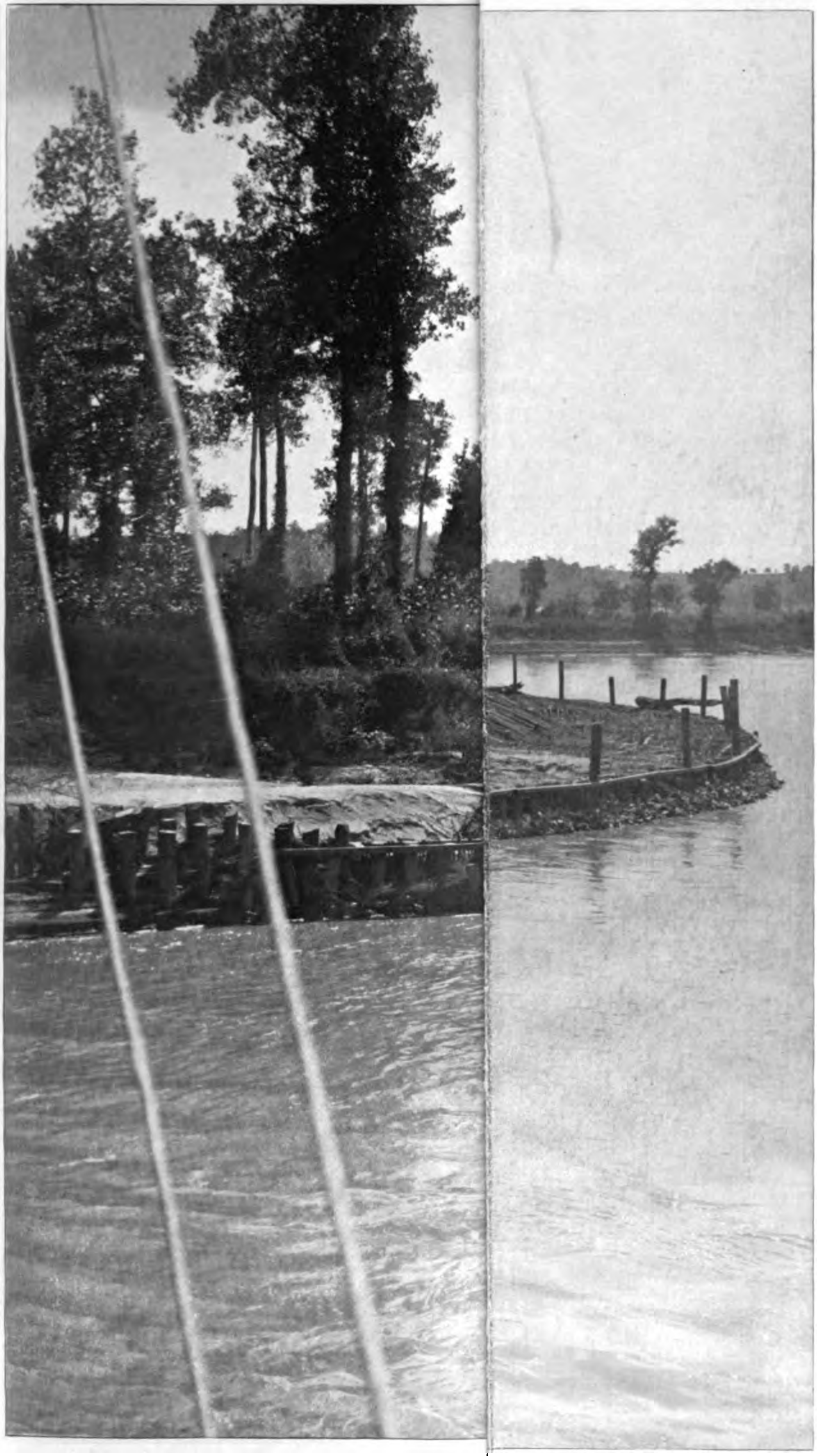
ABATTIS FROM SOUTH BANK OF HARDINS IS E DEPTH OF WATER DURING
CO

PLATE X.



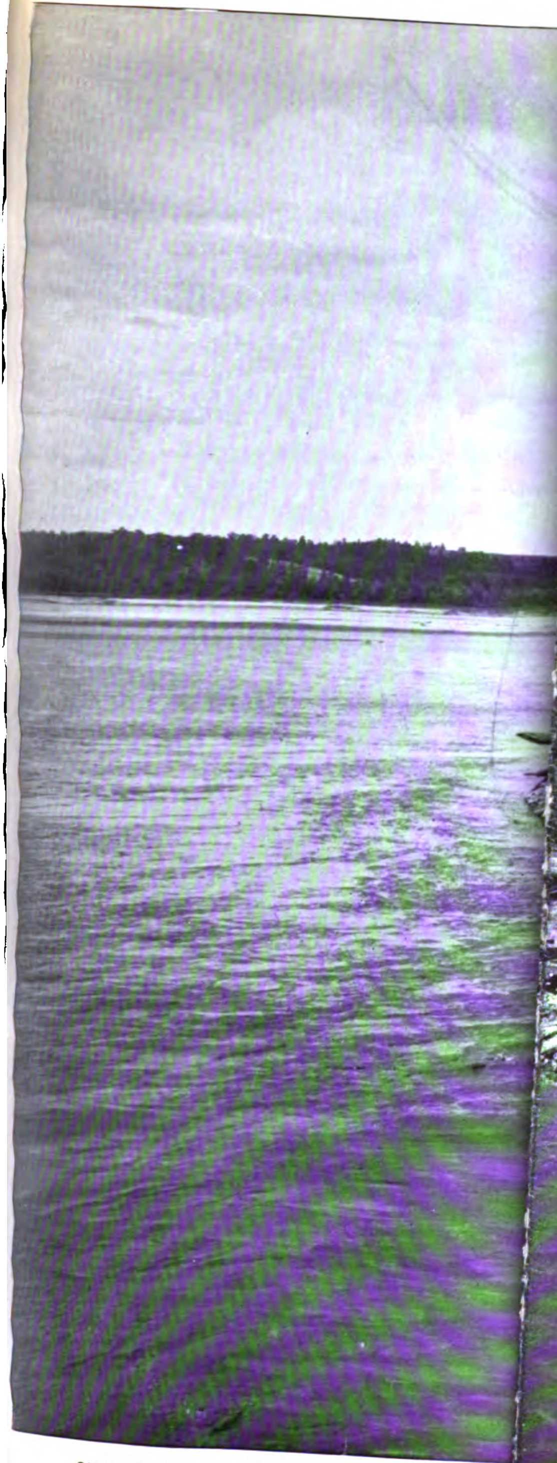
ABATTIS ABOVE HARDINS ISLAND. LOOKING INSHORE WORK LENGTH OF NEW WORK

PLATE XIV.



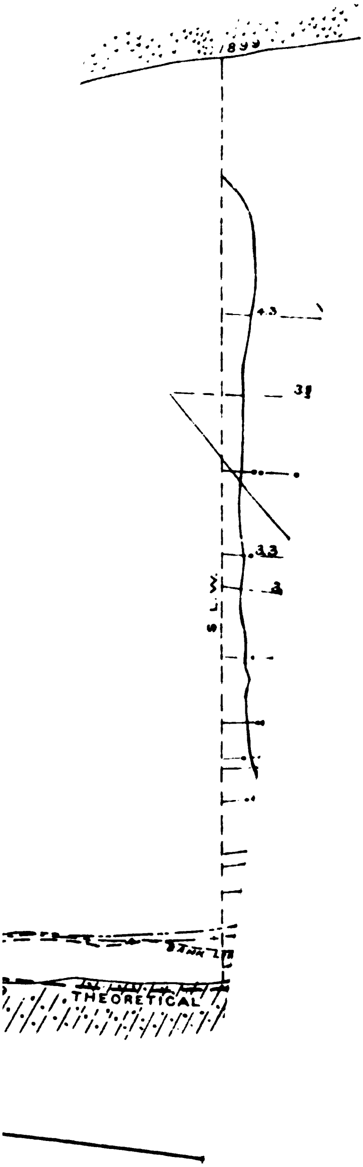
CHAMOIS

PLATE XV.



CHAMOIS BANK HEAD. FROM ROOF OF SNAG

FLOODS OF TWO SEASONS.


1899
4.3
3½
3.3
3
THEORETICAL

The small percentage of expenditure on account of construction work is accounted for by the fact that a very small portion of the item for plant service, repairs, and watching charges was incurred on this work.

The same may be said of the item of administration.

The item of freight charges includes $1,004.42 incurred on account of work done during previous fiscal year.

EXHIBIT B.

Elements of work and cost in detail on account of new junction of Osage and Missouri rivers, during the fiscal year ending June 30, 1899.

Classification and extent.	Cost in item.	Total.
Clearing and grubbing: Labor	$66.94	
Total cost of clearing and grubbing		$66.94
Removing trestle: Labor	69.33	
Total cost of removing trestle		69.33
Removing intercepting levee; excavating 1,939 cubic yards of earth, hauled 150 feet and wasted on ground east of cut: Labor	195.65	
Total cost of excavating 1,939 cubic yards of earth, at $0.101 per cubic yard		195.65
Making cut through Osage Point; excavating 24,262 cubic yards of earth, as follows:		
21,402 cubic yards hauled 326 feet and wasted in Osage River.		
2,340 cubic yards hauled 175 feet and wasted, part on upper side of embankment and part on accretions east of the north end of cut.		
520 cubic yards of semifluid mud from the floor of the cut and wasted in Osage River.		
Explosives	28.72	
Labor	5,935.22	
Total cost of excavating 24,262 cubic yards of earth, at $0.2458 per cubic yard		5,963.94
Excavating from the deposits in the low-water way to north of cut; 20,347 cubic yards hauled an average of 200 feet and disposed of as follows:		
1,988 cubic yards wasted on upper side of embankment near shore end.		
14,271 utilized in restoring to grade that portion of the north end of the embankment.		
2,044 cubic yards utilized in restoring to grade the lower slope of embankment.		
2,044 cubic yards wasted beyond the end of the embankment.		
Labor	3,752.02	
Total cost of excavating and placing, as stated above, 20,347 cubic yards of earth, at $0.1844 per cubic yard		3,752.02
Excavating ditch beyond the north end of the cut: Labor	167.87	
Total cost of excavating 711 cubic yards of earth, at $0.2361 per cubic yard		167.87
Paving cut and embankment in Dike 19½ A:		
634 cubic yards placed in reserve pile at top of slope.		
7,105 cubic yards placed in position at foot of slope.		
1,017 cubic yards paving 1,176 linear feet in cut.		
1,636 cubic yards paving 1,565 linear feet in embankment and around end of same.		
195 cubic yards spawling pavement in cut and embankment.		
10,587 cubic yards stone	11,620.88	
Labor	2,204.43	
Total cost of paving and placing stone, at $1.306 per cubic yard		13,825.81
Constructing three cross curtains:		
Materials—		
3,469 square feet wire netting	25.15	
814 linear feet pine piling	141.23	
129 cords brush and poles	194.65	
134 cubic yards stone	148.38	
918 pounds ⅜-inch strand	30.29	
120 pounds bolts, fastenings, etc.	2.40	
Towage of plant, materials, and supplies	82.86	
Labor	845.60	
Total cost of constructing cross curtains		1,470.56
Reenforcing curtain in Dike 19½ A:		
Materials—		
1,575 pounds ⅜-inch strand	51.98	
546 pounds fastenings	57.68	
5,568 square feet wire netting	40.24	
Labor	92.94	
Total cost of reenforcing curtain in Dike 19½ A		242.84

EXHIBIT B.—*Elements of work and cost in detail on account of new junction of Osage and Missouri rivers, during the fiscal year ending June 30, 1899*—Continued.

Classification and extent.	Cost in item.	Total.
Removal of obstructions from proposed waterway (Dike 19 B; removing drift, 120 linear feet of old foot mattress, and 106 piles in the dike):		
Explosives	$333.07	
Labor (degrading Dike 19 B, cutting off 42 piles)	1,157.11	
Explosives	11.08	
Labor (degrading Osage dam, cutting off 40 piles, and removing 67 cubic yards of stone and 10 cords brush)	30.50	
Explosives	41.34	
Labor (degrading Osage Point revetment, removing 150 cubic yards of stone)	186.68	
Labor	208.21	
Total cost of removing obstructions from proposed waterway		$1,967.99
Repairs to Dike 19½ A, reenforcing embankment and cross curtains:		
Materials—		
217 cubic yards of stone recovered from Osage dam and Osage Point revetment (no cost).		
91 cubic yards of stone	104.01	
91½ cords brush	135.59	
Towage to point of expenditure	3.39	
581 pounds ⅜-inch strand	19.16	
7 pounds binding wire	.17	
117 pounds fastenings	6.72	
2 burrs	8.96	
35 linear feet pine piling	6.30	
Towage of plant and supplies	29.00	
Labor	260.17	
Total cost of repairs to Dike 19½ A		573.47
Miscellaneous:		
Labor, hauling materials, supplies, etc	9.03	
Traveling expenses, board accounts, and freight charges	282.15	
Total miscellaneous charges		291.18
Total cost of work on account of new junction of Osage and Missouri rivers		28,587.10

EXHIBIT C.

Elements of work and cost in detail of repairs to Dike XXIII, Gasconade Division, during October and November, 1898.

Classification.	Cost in item.	Total.
Pile driving:		
Material and supplies—		
394 linear feet cypress piling	$66.35	
1,440 linear feet pine piling	249.84	
3,112 linear feet cottonwood piling	847.44	
Coal, oils, wastes, etc	24.32	
Labor	173.57	$1,361.52
Mattress weaving and sinking:		
Material and supplies—		
50 pounds fastenings	7.54	
2,362 pounds ⅜-inch strand	77.49	
123 cords brush	277.24	
Towage to point of expenditure	90.40	
100 cubic yards of stone	109.61	
Towage to point of expenditure	129.32	
Labor	166.63	858.23
Bracing:		
Material and supplies—		
11,600 feet B. M. long-leaf yellow-pine lumber	249.63	
2,153 pounds fastenings, bolts, washers, etc	95.94	
3,265 pounds ⅝-inch cable	81.63	
Labor	294.74	721.94
Curtaining:		
Material and supplies—		
13 cords poles	29.30	
47 pounds 60d wire nails	1.08	
Labor	9.90	40.28
Subsistence	194.23	194.23
Towage plant, materials and supplies	74.07	74.07
Miscellaneous items: Traveling expenses, board, etc	26.86	26.86
Total cost of repairs		3,277.13

EXHIBIT D.

Elements of work and cost in detail of constructing two groins at Chamois Bankhead during the month of March, 1899.

Classification and extent.	Cost in item.	Total.
Constructing 152 cookle burrs:		
Materials and supplies—		
Lumber	$191.52	
85 cords brush	169.65	
619 pounds wire	17.02	
246.6 cubic yards stone	245.39	
Towage, stone and brush	220.40	
Labor	439.39	
		$1,283.37
Labor, launching	193.88	193.88
Towage, plant, materials, and supplies	41.66	41.66
Board bills, traveling expenses, etc	17.25	17.25
Total cost		$1,536.16

EXHIBIT E.

Expenditure on account of plant during fiscal year ending June 30, 1899.

Classification.	Labor.	Subsistence.	Supplies.	Materials.	Total.
Care of plant:					
Watching, Gasconade division plant	$7,268.13	$1,871.70	$721.40		$9,861.23
Watching, detached works plant	74.84	22.00	2.75		99.59
Pulling out (9 hulls), as follows—					
Gasconade division (7 hulls)	867.05	252.26	79.07	$10.46	1,208.84
Detached works (2 hulls)	29.25	9.78	3.34		42.37
Launching (41 hulls), as follows—					
Gasconade division (17 hulls)	123.45	32.22	64.63		220.30
Detached works (24 hulls)	766.90	177.30	94.64		1,038.84
Cleaning, sorting, and storing	777.48	227.33	19.73		1,024.54
Steamboat service					1,143.79
Total	9,907.10	2,592,59	985.56	10.46	14,639.50
Repairs and alterations:					
Yard plant	1,266.38	305.25	56.24	723.41	2,351.28
Floating plant, Gasconade division	2,308.45	446.29	82.67	737.99	3,575.40
Floating plant, detached works	7,118.32	1,479.97	494.71	2,693.72	11,786.72
Current miscellaneous	501.42	85.24	.86	102.02	689.54
Total	11,194.57	2,316.75	634.48	4,257.14	18,402.94
New plant constructed:					
1 water filter	32.50	7.98		7.05	47.53
2 calking flats	32.02	5.27		61.30	98.59
Preparatory charges for construction of twelve 25 by 100 foot barges, as follows—					
Shifting of hulls on storage ways and moving of lumber to make room for construction	231.10	64.47	31.93	32.30	359.80
Spinning oakum	18.15	3.61			21.76
Making bolts and straps	119.21	24.98			144.19
Unloading and storing hardware	18.76	5.72			24.48
Total	451.74	112.03	31.93	100.65	696.35
New plant purchased:					
Rope, steel and manila					876.15
Hose, steam					75.00
Cameras, tripods, plate holders, and printing frames					90.90
Battery machine					20.00
Wheelbarrows, shears, files, shovels, spades, picks, and other tools					367.49
Brooms, mops, brushes, etc					55.60
Total					1,485.14
Miscellaneous:					
Preparing property for condemnation	50.51	19.26			69.77
Launching condemned barge	14.00	6.32			20.32
Total	64.51	25.58			90.09
Grand total					35,314.02

APPENDIX G.

ANNUAL REPORT ON LOCAL WORKS BELOW KANSAS CITY, BY MR. S. WATERS FOX, DIVISION ENGINEER.

MISSOURI RIVER COMMISSION,
Jefferson City, Mo., June 30, 1899.

COLONEL: I have the honor to submit the following annual report for the fiscal year ending June 30, 1899, of operations on local works below Kansas City, Mo.

Work was carried on near mouth of Little Blue, at Miami, above Glasgow, above Rocheport, near Huntsdale, at Howards Bend, above St. Charles, and at Pelican Bend. It comprised the construction of one new bankhead above Glasgow; the remodeling of five of the nine bankheads built during the previous year; the repair, reenforcement, and extension of the five above referred to and two others; dike construction and repairs; construction of abatis, as independent structures and temporary auxiliaries to bankheads; revetment construction, repair, and maintenance; surveying; care and repair of plant and miscellaneous incidental work.

The total expenditures during the year under the special and suballotments for these works were $115,480.25, as shown in the Appendix, Exhibit A. Liabilities amounting to $2,521.91 incurred on these works on account of care and repair of plant were by your direction charged to First Reach allotment.

The following illustrations accompany:

Six progress maps (Pls. I to VI) of Missouri River, showing location and character of work done and bank recession on each of the reaches excepting Miami, where, by your direction, no survey was made. On Pl. V, conditions of flow past the bankhead 6 F are indicated by floats and cross sections of river.

A plan of bankhead 3 A (Pl. VII), showing character and extent of work done during the fiscal year on that structure.

A chart (Pl. VIII) showing conditions of flow past bankhead 3 A, as indicated by floats and cross sections of river.

A plan (Pl. IX) of bankhead 1 B, as remodeled and extended.

A plan (Pl. X) of bankhead 2 C, as built.

A plan (Pl. XI) of bankhead 5 C, showing location of three groins built during the year and some pile-work extension in process of construction.

A plan (Pl. XII) of bankhead 6 C, showing character and extent of work done during the year.

A chart (Pl. XIII) showing conditions of flow past bankhead 6 C, as indicated by floats and cross sections.

A plan (Pl. XIV) of bankhead 1 D, as remodeled, showing recent bank erosion and damage to structure, also plan of new pile-work extension in process of construction.

A plan (Pl. XV) of bankhead 6 F, showing character and extent of work done during the year and proposed pile-work extension.

Three photographic views (Pls. XVI to XVIII) showing effects due to Dike 1 A, constructed during previous year.

One photographic view (Pl. XIX) showing Dike 1 B, as built during previous year, and accretions formed by it.

Four photographic views (Pls. XX to XXIII) showing dike work constructed during the year.

One photographic view (Pl. XXIV) showing construction party building abatis near Huntsdale.

One photographic view (Pl. XXV) showing bankhead 2 C, built during the year.

Twelve photographic views (Pls. XXVI to XXXVII) of the following bankheads, as first built during previous year and as remodeled during this year: 3 A, 1 B, 6 C, 1 D, and 6 F.

Three photographic views (Pls. XXXVIII to XL) showing bankheads 5 C, 4 F, and 5 F, completed during previous year.

One photographic view (Pl. XLI) showing gabion in process of construction.

One photographic view (Pl. XLII) showing gabions and burrs ready for use in groin construction.

Three photographic views (Pls. XLIII to XLV) showing construction parties at work launching gabions in groin construction at bankheads.

Two photographic views (Pls. XLVI and XLVII) showing completed groins above bankhead 6 F.

Two photographic views (Pls. XLVIII and XLIX) showing Pelican Bend revetment.

LITTLE BLUE REACH.

Bankhead 3 A repairs.—An eddy below this structure referred to in my last annual report continued to be violent and threatened the destruction of the bankhead. During the month of July three short spurs of brush weighted with stone were built in the pocket formed by the eddy, finally checking it, but not until 103 linear feet of the lower arm of the bankhead had been destroyed.

The repair of the bankhead by the renewal with pile work of that part which had been destroyed was begun on August 29 and practically completed September 25. It consisted of two-row work spaced 10 feet centers, the outer row of which was on the post circle, braced in the usual manner and having a foot mattress 50 feet in width. Both rows of the two-row work and alternate bents were curtained. The cross curtains consist of one row of piles with wales and curtains attached.

Bankhead 3 A, remodeling.—A plan for remodeling the structure was received September 8. This contemplated lowering the outer wall to an elevation of 2 feet above standard low water, the stone thus acquired to be thrown over in front; the removal of all stone back of the post circle and the cutting down of the earth to a berm 50 feet in width and which when paved with stone 12 inches thick would have an elevation at the post circle of 2 feet and at its inner line 6 feet above standard low water; from the inner line of the new berm the bank was to rise on a 1 on 2 slope to an elevation of 20 feet above standard low water, and, within the limits of 30 degrees above and 30 degrees below directrix, receive a paving of 12 inches of stone. This work was begun on September 13 and completed November 17. See accompanying plate (Pl. VII).

On October 6, while the work of remodeling the structure was in progress, a slump of the outer wall between radials 5 and 15 occurred, where it was most exposed to reef action. The outer wall between these limits disappeared below the surface of the water, and the bank back of the post circle also caved in to an irregular line that passed through post No. 5, was 10 feet back of post No. 13, and passed through post No. 15, posts Nos. 10 to 14, inclusive, being washed out. See plate (Pl. VII). The cavity thus formed was filled as soon as possible with stone. The outer wall was restored to a top width of 5 feet beyond the post circle and to an elevation of 2 feet above standard low water.

The reef action to which the structure was exposed continued to be very severe, and, as there was some movement in the outer wall, you directed, in a letter dated November 8, that two experimental groins, each about 30 feet wide on top, be built, the upper one between radials Nos. 12 and 15, the lower one between radials Nos. 21 and 24, the idea being to so obstruct the flow in the deep trench around the bankhead that the crest of the reef on the opposite side of the channel would be cut out; the upper groin to extend from the outer wall at an elevation of 5 feet below standard low water and run on a slope to the bottom of the river 100 feet out from the post circle, and the lower groin to a grade 5 feet lower.

The construction of the lower groin was begun early in November, but owing to the loss of the only available barge and the appearance of ice in the river the work was suspended when it was about 88 per cent completed. Forty cords of brush and 60 cubic yards of stone were expended in the form of fascines and "buttons," the latter a device composed of two square pieces of woven mattress, 20 by 20 feet, fastened together on their edges with brush and wire over a filling of stone ballast.

The cost of this work was $7,780.05, as shown in item in the Appendix, Exhibit B.

Soon after the suspension of work on this groin a very radical change in conditions occurred, and whether due to the groin or not was precisely what was desired. A small bar moved down and practically filled the pocket immediately above the structure, the trench above and for some distance below the groins was filled, and a new waterway of ample width opened up in front. These conditions were shown on a chart developed from a survey made November 25–30, a tracing of which was forwarded with my letter of December 14. The conditions of flow past the bankhead as they were June 16 are indicated by floats and cross sections of river on the accompanying map (Pl. I).

Bankhead 1 A.—The proposed location, plan, and specifications for this bankhead were received with your letter, dated August 16, and measures were taken for commencing its construction. The brush, piling, and stone were procured, but on account of shoal water, which made it impracticable to construct the bankhead on the proposed site, it was decided to await developments. All of the materials acquired were transferred for use on the works, excepting the stone, which was left in the quarry. The cost of the work was $1,542.66, as shown in the Appendix, Exhibit C.

Dike 2 A.—This dike was built as authorized on the line as shown on the accompanying map (Pl. I), between the dates of August 7 and September 17. It is 1,140 feet in length, built to a grade which slopes uniformly from standard high water at the shore end to 10 feet above standard low water at the outer or stream end. In the main dike there are 369 piles, of which 129 are pine and the remainder cottonwood; the dike contains 115 bents, 21 of which at the root are four row, the remainder three row. For anchorage, 34 cottonwood piles were driven.

The dike was curtained and braced throughout in the usual manner. A shore mattress 30 feet wide was laid from the main left bank 225 feet inshore, over the intervening low ground to the first pile bent, where it was increased to 65 feet in width and carried at that width 40 feet beyond the stream end of the dike.

A reenforce mattress was laid along the toe of the bank, above the root of the dike, beginning 60 feet above the upper row of piles and extending down 42 feet and overlapping the dike mattress 10 feet. This and the shore extension mattress were heavily ballasted with stone. The cost of the work was $7,800.04, as shown in item in Appendix, Exhibit D.

An inspection made of the dike between the dates of April 10 and 12 disclosed conditions which were most favorable. An accretion had formed below the dike to a height of about 12 feet above standard low water throughout its length. On the night of April 20, when the stage was close to standard high water, the dike was breached. An examination on May 2 disclosed a gap of 320 feet in the pile work between bents Nos. 7 and 39, and a waterway about 100 feet in width between the shore end of the dike and the main bank, the overflow having scoured under and lowered the shore extension mattress. The breaching of this structure, which was an unusually strong one, under such conditions can only be accounted for on the supposition, believed to be true, that the 100-foot barge sunk last winter in the crossing above the dike was set in motion by scour and drifted down against the dike. Such an object striking a dike near its top would impose stresses far in excess of those for which the dikes are designed.

A project submitted May 3 for closing the gap in the dike, which involved the use of plant on the Omaha division then located at Leavenworth, Kans., was approved on May 4, and steps were at once taken to assemble plant and construction materials for the work. The project provided for a new shore connection with three-row work on a line that at the bank is 125 feet above the upper row of the old work and its outer end 90 feet above at bent 41 of the old dike; a two-row connection to be run down stream from the outer end of the new three-row work to the old dike.

Pile driving was commenced May 22, but it was soon found impracticable to build the new work as proposed, under the existing conditions. The current, with a velocity of 12 feet per second, accompanied by more or less driftwood, whipped out or broke off piles about as rapidly as they could be driven, and the bank in the vicinity caved so rapidly that shore fastenings required almost constant attention.

With a view of relieving the situation the construction of a sheer dike was recommended and approved. This dike was to be made of clusters of three piles each, spaced 30 feet apart, on a line making an angle of 60 degrees with the line of the old dike, and, starting at a point on the temporary anchorage line above bent 7 of the old dike, extend to the shore above; the piles in each cluster to be spaced 5 to 7 feet apart at point of penetration in bottom and be drawn together and bolted at top. Work on the sheer dike was commenced June 4, and after fifteen clusters, about 420 linear feet of sheer dike, had been driven was suspended, it having been decided best to wait for a lower stage of river.

The cost of these repairs was $1,962.75, as shown in item in Appendix, Exhibit E.

MIAMI REACH.

Dike 1 B.—The extension of this dike, 300 linear feet to its full projected length of 1,800 feet, was commenced September 29 and completed October 22. The new work was of three rows of pine piles, spaced 10 feet, braced in the usual manner and curtained. Fourteen piles were driven for temporary anchorage and 98 in the dike. The foot mattress was 358 feet in length and 20,402 square in area. The cost of the work was $2,612.24, as shown in item in Appendix, Exhibit F.

Bankhead 1 B (see accompanying photographic plates (Pls. XXIX and XXX) and drawing (Pl. IX)).—The plan for remodeling and extending this bankhead provided for an increased depth of berm by building a new outer wall of two-row pile work, filled with brush and protected outside with 4 cubic yards of stone per linear foot, the piles spaced 5 feet centers in the bents and the bents 10 feet apart. Between the directrix and a radial 29° 30′ above, the piles of the outside row to be concentric with and 60 feet beyond the post circle and thence extend tangentially to a junction with the bank above. Below the directrix the new wall was to be brought in to the old one on a curve of 100 feet radius compounding with the upper one. To induce a deposit between the walls five radial curtains supported on a single row of piles were to be built extending from the old to the new wall. The old wall was to be degraded at its outer edge to 2 feet above standard low water—the same height as the new wall—and to 3 feet above at the post circle; the slope beyond the old 4-foot berm to be left covered with 3 feet of stone. The old outer wall from the directrix to radial 42 to have stone added sufficient to make its total quantity 125 cubic feet per linear foot. The plan also provided for grading and paving the upper arm 8 degrees beyond the old limits.

Work was commenced September 8, and practically completed in accordance with the plans at the end of that month, though, on account of the stage of river the pile and stone work could not then be gotten down to the required grade. An effort was made in November to reduce the structure to grade, but on account of a sudden rise had to be abandoned on the 20th of that month, after replacing the direct braces at an elevation of 3.17 feet above standard low water. It still requires the removal of about 60 cubic yards of stone to get the structure to grade. The following is a statement of the work accomplished:

Piles driven for new outer wall		82
Piles driven for radial curtains		15
Brush used for filling between piles	cords..	41.6
Stone used for sinking brush filling	cubic yards..	70
Stone filling on old outer wall below directrix	do....	120.2
Stone paving extension of upper area	do....	145.80
Earth excavation, extension of upper area	do....	207
Stone expended in new outer wall	do....	1,489.51

Of the last item 1,007.31 cubic yards were acquired by contract, 445.2 cubic yards from old wall, and 134 cubic yards from reserve supply.

The cost of the work was $3,260.81, as shown in the Appendix, Exhibit G.

The object in view, as stated in the approved project, in building one dike and one bankhead in Miami Bend was to close the left-hand chute and stop the caving of the left bank; to protect the right bank and shape the river for the crossing to De Witt.

For lack of funds no recent survey has been made of the reach, so that the present conditions of the flow cannot be accurately stated. It appears, however, that notwithstanding large accretions above and below Dike 1 B the main flow and steamboat channel still follows the left-hand chute. Considerably less than half the volume of the river passes the bankhead.

GLASGOW REACH.

Bankhead 6 C extension and repair.—About the middle of July the left bank of the river between bankheads 5 C and 6 C began caving at a rapid rate. Bankhead 6 C was soon uncovered and a violent eddy, caused or aggravated by a gumbo point which developed on the shore about 200 feet above the bankhead, threatened to flank and destroy that structure. About 15 feet of the paved slope at the upper end of the structure was lost and 25 feet of the outer wall so degraded as to require rebuilding. Between July 25 and August 8 the outer wall was reenforced with stone and extended upstream to a junction with the bank, the stone being thrown in on line of post circle and allowed to take its own slope, and in this way built up to an elevation of two or three feet above standard low water. Two short spur dikes built of fascines were constructed inside the wall to check the eddy. There were used on this work 640.92 cubic yards of stone obtained from the storage piles at bankheads 4 C, 5 C, and 6 C.

Bankhead 6 C, remodeling, reenforcing, and extending.—On September 12 the plans for remodeling, reenforcing, and extending this structure were received. They were practically the same as for bankheads 3 A, except that the outer wall was to be extended 90 feet upstream by filling out from the bank to the post circle with earth and protecting the fill with 4 cubic yards of stone per linear foot; but owing to the prevailing high stage of the river at the time work was commenced the new berm was cut so that when paved it would slope from the foot of the 1 on 2 slope to the top of the old berm, and instead of using groins to reenforce the structures, as at 3 A, it was decided to build a subaqueous berm of stone around the outer wall from post No. 0 of the old structure to 30 degrees below the directrix; 5 cubic yards of stone per foot to be used in its construction and to be so placed as to form a berm, the surface of which would be approximately level and 5 feet below standard low water. Work upon this plan was begun October 19 and continued until its completion, November 17.

The following is a statement of work done:

	Cubic yards.
Earth excavated	7,085
Stone acquired from old structure stone	336.54
Expended in 90-foot extension of outer wall	360
Stone expended in filling as backing for extension of outer wall	200
Stone expended in filling up outer wall above directrix	42.24
Stone expended in filling out 125 cubic feet per foot, the outer wall below the directrix, of which 45.54 cubic yards were acquired from old structure	74.24
Stone, of which 291 cubic yards were acquired from old structure, expended in paving new berm and slope	734.56
Stone expended in building subaqueous berm	507.67

A reserve supply of 117.20 cubic yards was placed on the bank at the structure for subsequent use if needed. The cost of this work is shown in the Appendix, Exhibit H.

The snag boat *Suter* was employed October 21-23 washing sand and mud from the lower arm of the bankhead.

Three photographic views (Pls. XXXI, XXXII, and XXXIII) accompany, the former showing the bankhead before being remodeled, the two latter afterwards.

Bankhead 6 C, groin construction.—Soundings taken November 30 at this structure showed a marked trench in the bottom that followed closely the outer wall. The maximum depth below standard low water was 35.5 feet on radial 9 at a distance of 57.5 feet out from post circle. This concentration of flow with its abnormally high velocity was objectionable not only as a menace to the life of the bankhead, but in a measure to the interests of navigation as well.

The filling up of the trench around bankhead 3 A, which attended or was coincident with the construction there of a subaqueous groin, indicated the feasibility of filling the trench around Bankhead 6 C by similar means. With this object in view four subaqueous groins were projected, their center lines being on radials 1, 8, 19, and 26 of the bankhead. They were to extend radially into the stream a distance of 110 feet from the post circle and be built to a grade that sloped uniformly from 8 feet below standard low water at their junction with the bankhead wall to 12 feet below at their outer ends. It was supposed that a bottom width of from 20 to 30 feet and a top width of 8 to 10 feet would be sufficient.

Models of various devices that suggested themselves for use as elements in groin construction were made. In all these the objects kept in view were to secure an open cellular structure so arranged that for a given size in cubic feet a minimum expenditure of labor and material consistent with requisite strength would be necessary, and as far as practicable the use of metal fastenings that would in time lose their strength by rust was to be avoided. The one selected resembled somewhat in form a cockle-bur, and was called a bur. A description of this bur is given in my annual report for Gasconade division, to which I beg leave to refer. A photographic view (Pl. XLII) of some burs ready for launching accompanies.

When, on January 6, it was decided to build the groins, it was found that the money available would be barely sufficient for two of them, and measures were taken for the construction of the two upper ones, numbered, respectively, 1 and 2.

On account of exposure to running ice in the river all floating plant was removed at the close of each day's work to a safe harbor. Ninety-three burs were constructed during the month, of which 45 were placed in Groin No. 2, between the 16th and 23d. Soundings taken after they were placed indicated that a groin had been built up between radials 6 and 9 for a length of 110 feet from the post circle to an irregular height of from 4½ to 12½ feet above the bottom. The greatest depth, reduced to standard low water, over the groin was 31 feet, and there was a fill above and below it about equal to its height; while out in front there was a compensating scour of bottom, the line of swiftest flow having moved out 50 feet. An effort was made during the month of February to complete the construction of these two groins from the ice, but the conditions of the weather prevented it, and only the construction of an additional stock of burs could be accomplished. It was not until March 10 that this work could be resumed. Between that date and the 16th 111 burs were placed in Groin Nos. 1, and 11 in Groin No. 2. On account of the swift current and greatly increased depths the burs could not be kept within the proposed limits of the base, and a greater number were therefore required to bring the groins up to the desired grade. After placing the burs last above mentioned, the violent eddy action above the bankhead stopped, but the effects below were in a measure nullified by the flow from a new channel which approached the bankhead from the right of a large middle ground that had formed in the bend above. The result of these new conditions of flow was an accentuation of that feature which it was expected to remedy by the groins—viz, the trench around the bankhead. The bar which had formed at the lower end of the bankhead scoured out, and below the directrix the opposite bar approached the structure until the entire volume of flow was concentrated to a low-water width of 300 feet, and depths of 40 feet below standard low water were found around the structure. Measures were at once taken to build the groins up to the proposed grades.

Two gabions and 31 burs were constructed and placed in Groin No. 1. Just to what extent the groin was raised could not be ascertained on account of the swift current. The device here referred to as a gabion is a hollow cylinder of brush work (10½ feet in diameter and 30 feet long unless otherwise specified), stiffened against crushing by five frames of sawed stuff held together by wedged oak pins. The ends of the gabions were closed with brush, and three brush partitions were introduced to insure the even distribution of the 8 to 12 cubic yards of stone used to sink it. Some photographic views (Pls. XLI, XLII, XLIII, and XLIV) showing gabions in process of construction, completed, ready for launching, and being launched are furnished herewith.

In order to meet the conditions of flow as they developed, and as indicated by a study of groin action, three additional groins, A, B, and C, were authorized.

Soundings taken May 3 developed that there had been a loss by scour, due to eddy action, of the outer wall of the bankhead and the greater portion of the berm below radial 24.

Groins A and C were placed in the eddies above and below the bankhead to break up the eddy action and to distribute over a larger area the previously concentrated action of the current. Groin B was placed on a line parallel with Groin No. 2, starting from the top of the bank on radial 33.

Between the dates of May 7 and June 2 the following elements were used in the construction of these groins:

Groin A: 12 gabions, 10½ by 30 feet; 10 fascines, 4 by 30 feet; 12 fascines, 3 by 18 feet.

Groin B: 1 gabion, 4 by 30 feet; 2 gabions, 8 by 30 feet; 2 gabions, 10½ by 30 feet; 2 fascines, 4 by 30 feet.

Groin C: 1 gabion, 9 by 30 feet; 18 gabions, 10½ by 30 feet; 53 fascines, 4 by 30 feet.

Soundings taken May 31 on line of Groin C showed a depth of 64 feet below standard low water at the end of the groin, indicating a scour since the 8th of that month of 25 feet. A profile of the groin indicated that its gabions were rolling out to fill the hole made by scour. These great depths, accompanied as they were by high velocities, were alarming and, in view of the fact that for some time previous the flow to the right of the middle bar above had practically stopped and was concentrated above 5 C, somewhat perplexing, giving room for doubt as to the efficiency of groins for the purpose desired, or, at least, warranting the belief that possibly their disposition, grades, or lengths were not correct.

Bankhead 6 C, levee work.—In the latter part of April—just before the bank was submerged—a levee was thrown across the low ground above the bankhead at an expense of $23, with a view of preventing overflow. The levee proved to be too light and was breached. The effect of the flow, which then passed around the bankhead to the rear, did little damage, but showed the danger from that source, and it was decided to provide against its recurrence by building a new levee from the bankhead to higher ground above on a line parallel to the bank and 100 feet inland, the height of the levee to be 19 feet above standard low water after shrinking. Work upon it was commenced May 29 and completed June 17. It is 920 feet long, contains 2,342 cubic yards of earth, and has an elevation of 19 feet above standard low water.

Abatis B, above Bankhead 6 C.—In a letter dated June 5 you directed the construction of two lines of abatis above Bankhead 6 C, located with a view of building up the bottom by deposit, so as to make it practicable to extend the post circle with two-row pile work on a 1,000-foot radius to a connection with the bank above. The lower one of these—Abatis B (see accompanying plate Pl. XII)—was built between the dates of June 21 and 28.

Seven piles were driven for anchorage; three sections, 43½ feet in length, 10 to 20 feet in height, were constructed and sunk. In order to make a good connection with the bank, six fascines 4 feet in diameter and 20 feet long were constructed and sunk between the shore section and the bank. The immediate effect of this structure was the quieting of the flow below it, and no doubt a fill has been started.

The cost of the foregoing works on account of Bankhead 6 C, aggregating $10,604.45, are shown in item in the Appendix, Exhibit H.

Dike 3 C, construction.—The projected length of this dike was 500 feet. It was to be 4-row work from the shore 27 bents out and 3 beyond; the spacing 10 feet and braced as usual. The grade to be level and even with the top of the bank for 30 bents from shore out, 13.25 feet above standard low water, and then drop on a uniform grade to 10 feet above standard low water at the outer end.

Work was begun in accordance with above plan October 22 and continued until the completion of the dike, November 19, during which time 22 piles were driven for anchorage and 187 in the dike; 650 linear feet, or 39,381 square feet, of mattress were woven, of which 72 linear feet 40 feet wide was a shore mat above root of dike overlapping upper edge of foot mattress; 608.1 cubic yards of stone were expended in ballasting subaqueous mattress, paving shore mat, and reenforcing the root of the dike. After bracing the dike in the usual manner a double curtain of poles was attached to the wales on the second, third, and fourth rows of poles for the first 12 bents out from shore, and from there to the end of the dike a single curtain was attached to the second row. The cost of this dike, $3,918.42, is shown in detail in the Appendix, Exhibit I.

Bankhead 5 C, reenforcement.—Until May of this year the conditions at the bankhead remained so quiet the following work seemed all that was required: It was proposed to reinforce the outer wall by adding enough stone below the directrix to make the total quantity in it uniformly 125 cubic feet per foot, to fill out some pockets that had formed in the outer wall, and to further reinforce it by a subaqueous berm of 3 cubic yards of stone per linear foot placed around the outer wall from post No. 0 to the new directrix, 32 degrees below the upper end of the structure.

Work was commenced in November, but on account of running ice in the river had to be suspended after one barge, containing 112.3 cubic yards of stone, had been delivered at the bankhead, and but 6 cubic yards from that load were expended in the subaqueous berm, the balance being stored as a reserve supply on the bank.

Bankhead 5 C, groin construction.—Anticipating similar action above this bankhead to that at 6 C, authority was given for the construction of two groins, the upper one on a radial line 30 degrees above the new directrix, and the lower one on a radial line passing through a point 70 feet below, measured on the post circle. These groins were to extend beyond the post circle 110 feet and to be built up to a grade of 8 feet below standard low water at the bankhead wall and 12 feet below at their outer ends. It was not until April that work on these groins was commenced. Six gabions were placed in the upper groin and four in the lower. After placing them the high stage of water and swift current prevented a full investigation of the effect due to them.

In order to meet the conditions of flow as they developed at this structure two additional groins, A and C, were authorized, the former being in the eddy above and the latter in the eddy below. On May 21 the bank immediately above the bankhead began caving at such a rate that the construction of Groin A was begun on the 22d and completed, in accordance with the plans, on the 25th. Twenty-four burs and 36 fascines, the latter 4 feet in diameter and 30 feet long, were placed. The action of this groin in breaking up the eddy and stopping the caving above the bankhead was prompt and very marked.

Bankhead 5 C, pile-work extension.—About the time of the completion of groin A, above referred to, the effects of some important changes in the regimen of the reach above began to be manifest. The flow through the right-hand chute below New Frankfort predominated to such an extent that it became the main channel of the river, and the resultant flow after its junction with that from Little Missouri Bend was such as to encourage the enlargement of the channel way down the main left bank of the river, and, by cutting away the great middle bar above and in front of Dike 3 C, throw the main flow with less force on the dike and an increasing force on the low bank and bar below 3 C. The latter receded under this action, but in doing so set up conditions that caused a comparatively short crossing over to the left bank between 4 C and 5 C, the point of impact varying with stage, and notwithstanding the counteracting effect of the flow down the left bank above 4 C, the attack on 5 C became very severe. Groin A settled and the bank above the bankhead receded rapidly, until a large pocket with a violent eddy had formed and a portion of the upper paved cone of the bankhead, and possibly some of the outer wall, were destroyed. See accompanying plate (Pl. XI).

The conditions became so alarming that in a letter dated June 16 you directed that a two-row pile extension of the post circle be built as follows: The outer row of the two-row work to be driven on an arc of a circle of 1,000 feet radius, the center of which was located on new directrix extended and distant from the existing post circle 960 feet. Cross curtains built on radial lines 40 feet apart at two-row work and extending to the bank, supported on single rows of piles, were provided—this work to extend from the point where the 1,000-foot circle entered the bank to a short distance below groin A. All piles were to be driven as near to bankhead grades as the stage of river permitted and curtained, that portion left above grade to be cut off whenever the stage was such that it could be done.

Work in accordance with the foregoing was commenced June 29, and at the close of the day's work on June 30 the following had been accomplished: Twenty-five piles had been driven in the two-row work and 11 piles in radial curtains.

Bankhead 5 C, levee work.—A levee 60 feet long, containing 160 cubic yards of earth, was built back of this structure to a height of 19½ feet above standard low water to prevent a flow at high stages of the river from passing back of the bankhead.

The cost of the work at this bankhead is shown in detail in the Appendix, Exhibit J.

Bankhead 4 C.—This structure has not been in the line of active flow, and during the entire year has remained covered with mud, as it was at the close of the previous year. The indications are that it will be soon uncovered by the flow in the chute which follows the left bank above, and it is proposed to remodel the structure at such time as the work can be most advantageously and economically done.

Bankhead 2 C.—See accompanying plates (Pls. X and XXV). The construction of this bankhead, at the foot of Little Missouri Bend, in accordance with the plans was commenced on October 6 and practically completed November 14. The plan, which differs somewhat from those previously built, may be briefly described as follows:

The center of the bankhead was located 304 feet inshore from the 20-foot contour of the bank and on a line called the directrix, which line is about normal to the trend of that contour in that locality. The outer wall was built of two rows of piles spaced 10 feet centers in the rows and 5 feet centers in the bents. A contin-ous filling of brush weighted with stone was built up between the piles from the bottom of the river to an elevation of 2 feet above standard low water. A cross-tie of cottonwood lumber was spiked on the upper side of the piles of each bent to prevent spreading. Outside these piles a wall of loose stone containing 4 cubic yards per foot was provided; the wall, when completed, was to be at a uniform height of 2 feet above standard low water. The outer row of piling is on the arc of a circle of 400 feet radius from the center of the structure located as above stated, all other work being concentric. The outer wall extends from the bank above the directrix to 30 degrees below the latter. Within the limit of 30 degrees either side of the directrix the upper bank was graded to a slope of 1 on 2 and paved with stone. This slope extends from an elevation of 7 feet at its foot to 20 feet above standard low water. The space between the foot of the slope and the outer wall is to be filled up with deposit from river, by means of several radial screens which were built to such grades that the deposit will form a level berm 35 feet wide, measured inshore from the outer row of piles in outer wall, and another sloping berm from there 35 feet inshore to the foot of the 1 on 2 slope. The cost of the work was $5,454.92, as shown in item in Appendix, Exhibit K.

The following work was accomplished in accordance with the above plan:

Piles driven in outer wall		86
Piles driven in radial screens		46
Cords of brush expended in filling in outer wall		169.01
Stone expended in filling in outer wall	cubic yards..	304.35
Stone expended in paving 1 on 2 slope	do....	313.18
Stone expended in outer wall	do....	1,703.18
Stone stored on bank for subsequent use if needed in extending outer wall upstream	cubic yards..	600
Earth excavated and placed in fill in front of 1 on 2 slope	do....	2,884
Poles expended in curtaining structure	cords..	17.11

Dike 3 C, damages and repairs.—During the sudden rise in the river, November 21–23, and in the run of ice that followed, considerable damage was done to the curtain of the dike, particularly from the thirteenth bent out to the end. From the shore out to bent No. 22 the curtain was repaired where needed. From that point to the outer end it was opened up, so that the effect on the flow would be a diminishing one from the shore out.

On December 22 there was a general movement of ice in the reach, and the conditions of flow approaching the dike were such that the structure was exposed to the full force of it. The channel way beyond being restricted, little ice passed that way until the entire bend above the structure had been gorged, forming a field that extended from the shore bar at the head of the bend to the outer end of the dike. In resisting this attack the dike was damaged somewhat. The piles in bents 15 to 18 were broken, but not carried away; from bent 19 to 25 they were forced down out of line, but not broken. See accompanying photographic view (Pl. XXII). Measures were at once taken to reenforce the dike, and between December 24 and 31 the following was accomplished: A single row of piles 10 feet below the lower row in the dike and spaced 10 feet apart was driven from bent No. 2, at the shore, to bent No. 11. This reenforce work was connected by the usual bracing to the dike, making that portion of it a five-row structure.

Immediately below each of the broken bents—15 to 18, inclusive—a cluster of three piles were driven and braced to the piles in the dike.

The cost of these repairs was $265.28.

The formation of the ice gorge above the dike resulted in the enlargement of the water way beyond its stream end and incidentally relieved the situation at the dike, as well as in Wilhoites Bend. With a view of stopping further loss to the dike from scour at its outer end, 208.73 cubic yards of stone were expended there on May 10 and 11.

Cambridge Bend revetment, maintenance and repair.—With a view of stopping further loss of this revetment at its lower end, due to the violent eddy that existed there, you authorized work as follows: Two-row pile work, spaced 10 feet each way, and driven so that the outer row would lie on the arc of a circle 350 feet radius that was tangent to the curve of the shore line of the revetted bank above; the pile work to be braced and screened and provided against scour with ample foot mat; two radial curtains to extend from the pile work to the bank were provided to cause the pocket to fill up; the pile work to join the revetment at the 3-foot contour, and at that point the old bank to be degraded to an easy approach to the work below. Work in accordance with those plans was commenced October 29 and completed November 20.

The following is a statement of what was done: Seventy-six piles in all were driven; 375 linear feet, or 18,320 square feet, of mattress were woven and sunk, expending 102.65 cubic yards of stone; 934 linear feet of curtaining was attached, and the upper bank at the lower end of the revetment was uncovered by the removal of 60 cubic yards of stone, graded down to an easy slope, and repaved. The cost of the work was $1,150.53, as shown in item in Appendix, Exhibit L.

During the month of March it was discovered that a piece of the woven mattress that had been placed on the bank immediately above the pile work had rolled up and was somewhat torn during the rises which attended the breaking up of ice in the river. The mattress was straightened and heavily ballasted, 255.57 cubic yards of stone being used. At two places on the revetment above, where the upper bank was bare and the mattress had been cut through by the ice, repairs were made requiring the expenditure of 200.58 cubic yards of stone.

The cost of this work was $752.32.

Abatis below Dike 3 C.—The object in view in building this line of abatis is to cause and maintain a high crossing into Wilhoites Bend. It was desired that the tips of the screen poles should extend to an elevation of about 2 feet above standard low water, and the depths were so great that in order to accomplish this it was necessary to make the framework of sawed stuff somewhat larger than the standard size ordinarily used. The frame was given the form of an isosceles triangle, the two equal sides being 14 feet long between centers of bolts and the other 12 feet, so that 16 and 14 foot stuff was used. In position the frame set up on one of its longer sides, giving a height of about 10 feet to the top waling.

Work on this structure was commenced June 23. Twenty-two piles were driven for anchorage and one section of abatis 53½ feet in length and from 10 to 20 feet in height was constructed and placed near the shore. Five fascines were made and sunk between this section and the shore to get a good bank connection. On the 28th all anchor piles, except the three nearest the shore and one other 200 feet out, were broken down by heavy running drift. On account of the difficulties of construction under such conditions, work was suspended on the 29th.

The cost of this work is shown in the Appendix, Exhibit M.

ROCHEPORT REACH.

Bankhead 1 D, remodeling and extending.—See accompanying map (Pl. III). Between the dates of October 8 and November 3 this structure was remodeled in accordance with instructions contained in your letter of September 16 and the plans which accompanied it. See accompanying drawing (Pl. XIV) and photographic view (Pl. XXXV). A photographic view (Pl. XXXIV) shows the structure as it was in August before remodeling. The plan of remodeling was similar to that of the bankhead 3 A, except that the outer wall was extended upstream to a junction with the bank on an earth fill protected by 4 cubic yards of stone per linear foot.

The following work was done:

The outer wall was cut down to grade and the stone thus acquired, 1,326 cubic yards, was thrown on the outer face; 5,939.7 cubic yards of earth excavated and used in developing new slopes; 284.3 cubic yards of stone were expended in filling out the outer wall to 150 feet per linear foot and extending it upstream 60 feet to connect with the main bank; 887.6 cubic yards of stone were expended in paving the new berm and slope; 273.4 cubic yards of stone were stored at the structure for future use.

Bankhead 1 D, extension and repair.—The bankhead stood very well until the early part of June. On the 12th of that month advice was received to the effect that a part of the structure had gone into the river. In a letter dated June 14 you directed a pile-work extension to be built at once, and transmitted plans for same. The plans provided for two-row pile work with 10-foot spacing; the outer row driven on the arc of a circle of 1,000 feet radius, the center of which is on radial No. 9 extended and 1,000 feet from the post circle. Cross curtains extending from the two-row work to the bank, and supported on single rows of piles spaced 10 feet, were to be built on radials 40 feet apart at the outer ends. All piles were to be driven and braces and curtains attached as close to the bankhead grades as the stage of river would permit, to be finally cut to grade whenever the river shall reach such a stage that the work may be done.

Plant and materials were assembled as quickly as possible, and driving commenced on the 25th of June. Four days later you visited the work and directed that the two-row work in the outer wall extension be stopped at the bent next below the second radial curtain, and that instead of the two lower radial curtains a two-row dike be built out to the inner line of the berm produced on a radial midway between them, to be provided with a foot mat 20 feet wide. See accompanying plate (Pl. XIV). At the close of the day's work on June 30 the status was as follows: Sixteen bents of two-row work on the 1,000-foot curve had been completed excepting the curtains. The upstream end of the two-row work is 22° 57′ above radial No. 9, and it is 151 feet long; the piles in the two radial curtains had been driven and braced, but the curtain poles had not been attached. The upper one is 125 feet long, has 11 piles in it, and is on a radial of the 1,000-foot circle, 17° 46′ above radial No. 9; the other one is 147 feet long, has 14 piles in it, and is on a radial 14° 55′ above radial 9; 12 bents or 115 linear feet of two-row work had been completed excepting the curtain. The center line of this work is on a radial of the 1,000-foot circle, 10° 40′ above radial 9.

The extent to which the bank had receded during the attack and the damage done to the structure are shown on the accompanying plate (Pl. XIV). The conditions of flow past the bankhead, as indicated by float paths and velocities, with cross sections of river, are shown on the accompanying map (Pl. III).

The cost of this work to June 30 was $3,322.09, as shown in the Appendix, Exhibit N.

HUNTSDALE REACH.

[See accompanying map (Pl. IV).]

Abattis construction.—A copy of the approved project of September 22, for the expenditure of $10,000 allotted for work near Huntsdale, Mo., was received with your letter of September 29. The project provided for the construction of two lines of abattis (shown on the map, A and B), aggregating 700 linear feet, of a total estimated expense of $2,400. The balance of the allotment, $7,600, was to be held in reserve.

The two lines of abattis were built between the dates of December 8 and 30. The upper one is 215 feet long and the lower one 473 feet. The cost of the work was $815.83, or $1.186 per linear foot, as shown in detail in the Appendix, Exhibit O. A photographic view (Pl. XXIV) of the construction party at work on abattis accompanies.

All that was expected has been accomplished by the abattis. The depression in the bar near the shore end has been filled and a shore bar raised to a general level that averages close to 12 feet above standard low water and chords the bend on or near the project line. The situation as it was when the last survey was made, June 1 to 4, is shown on the accompanying map (Pl. IV).

HOWARDS BEND REACH.

Bankhead 4 F.—Work on this structure consisted in fairing out the outer wall between radials Nos. 13 and 31 with 100 cubic yards of stone; reenforcing the outer wall from the directrix to radial No. 40 with 75 cubic yards of stone, necessary to bring it to a uniform section of 125 cubic feet per linear foot; storing 455 cubic yards of stone at the structure for subsequent use, and in leveling the pile of waste earth with slip scrapers, requiring the handling of 1,400 cubic yards. This work was begun October 24 and completed November 3. The total cost, as shown in Exhibit P, was $395.37.

Bankhead 5 F.—Work on this structure consisted in repairing the berm inside the post circle between radials Nos. 54 and 61 with an expenditure of 74.82 cubic yards of stone, in reenforcing the outer wall to the full section of 125 cubic feet per linear foot from the directrix down to radial No. 61 with an expenditure of 530.20 cubic yards of stone, in fairing out the outer wall between radials Nos. 33 and 40 with 51 cubic yards of stone, in storing 119.30 cubic yards of stone upon the bank at the structure for subsequent use, and in leveling with slip scrapers the pile of waste earth that had been left upon the bank during the previous season's work, requiring the handling of 1,650 cubic yards.

This work was begun September 19 and completed October 22. The total cost, as shown in Exhibit P, was $1,059.19.

Bankhead 6 F, remodeling and extension.—The work of remodeling this structure was commenced September 25 and completed November 17, after having been suspended between the dates of October 22 and November 7, on account of high water. The plans were practically the same as for bankhead 3 A, except that the outer wall was extended upstream 90 feet by an earth filling protected by an expenditure of 4 cubic yards of stone per linear foot. Two photographic views accompany (Pls. XXXVI and XXXVII), the former showing the bankhead before, the latter after remodeling. A plan of the bankhead (Pl. XV) also accompanies, showing the structure as remodeled and all of the other work done at and near the structure during the fiscal year, as well as the proposed extension upstream.

In excavating for the new berm large quantities of driftwood embedded in the bank were encountered and an hydraulic grader was substituted for plow and scrapers with very satisfactory results. Dynamite was also used to break or loosen the driftwood. In making the earth fill for the upstream extension of the outer wall the hydraulic jet was used, and to prevent the swift current of the river from washing away the earth thus degraded, a woven mattress 25 feet wide was suspended on edge by a row of posts driven on the 350-foot circle. The usual quantity of stone—4

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[illegible] was then placed against the mattress. The jet was also [illegible] in destroying the stone in the outer wall, by washing out the [illegible] sand which had filled the voids. The earth fill back of this extension was [illegible] to the same grade as the paved berm—viz, 2 feet above standard low water [illegible] circle—sloping up to 6 feet above, 50 feet back. It was not paved. [illegible] the following is a statement of work done:

Earth removed by grader:		
Making fill back of 90-foot extension	cubic yards..	1,855
Degrading original structure from radial 0 to 38	do....	7,072
Earth removed by teams and slip scrapers:		
Removed earth at lower end of sloping berm	do....	300
Forming unpaved slope between radials 26 and 49	do....	1,250
Wasting old earth piled back of structure	do....	700
Earth removed by laborers cleaning berm outside of post circle	do....	185
Total amount of earth removed in remodeling this structure	do....	11,362
Paving berm and 1 on 2 slope:		
Area paved	square yards..	27,106
Stone expended	cubic yards..	1,004
Stone expended in outer wall 90-foot extension up-stream	do....	360
Stone expended in outer wall between radials 0 and 44	do....	749.81
Stone stored at structure for subsequent use	do....	140

Of the amount of stone above expended, 1,115.70 cubic yards were acquired from the old structure.

The cost of this work, as shown in Exhibit Q, was $11,418.19.

Bankhead 6 F, groined and abatis construction.—This bankhead, located at the foot of Howards Bend, is 5,575 feet measured on the shore line that existed at the time it was projected, below bankhead 5 F, and there was no intervening work for the protection of the bank. On this account and the fact that the bankhead was not properly oriented the structure was unduly exposed. Early in March there were indications of trouble and in April you directed the construction of two groins, Nos. 1 and 2, at this bankhead, located respectively on radial 2 and on a line parallel to radial 2 from post No. 9. A party was at once organized and engaged in getting out the necessary materials with which to construct gabions to be used in building these groins. Work was begun on the 17th of that month, and the first gabion was placed in groin No. 2 the next day.

On account of high water and heavy runs of drift the placing of gabions in the groins had to be suspended on the 21st, but the construction of them continued. An effort was made to resume work on the 26th, but it was next day before plant could be held in position long enough to launch them.

During the rising stage of the April flood, which crested on this reach on the 26th, the caving of the bank between bankheads 5 F and 6 F was very active, particularly so in the lower portion. From about the half-way point the reef followed very closely the receding bank, and for a time it seemed as though the bankhead would be outflanked and destroyed. A great shoulder developed in the shore line immediately above, the paved slope of the upper cone of the structure was destroyed as far down as radial No. 9, the outer wall above radial No. 0 degraded to a greater or less extent, and the paved berm above radial No. 9 lowered by scour from 2 to 10 feet. See accompanying plate (Pl. XV).

On account of these developments you directed the construction of two additional groins, A and B, on radials Nos. 5 and 15 respectively, above radial No. 0. The former of these groins was to extend from the main bank to the outer wall, its top surface conforming in profile to that of the bankhead produced. Groin B was to be built like groin A, but to extend 140 feet beyond the 350-foot circle of the bankhead, the grade of this portion sloping from 2 feet above standard low water on this circle to 20 feet below at the outer end. Each of these groins was built in accordance with the plans.

Work on Groin No. 1 was commenced April 30 and completed May 8. There were expended in the construction 7 gabions, 10½ feet in diameter, 30 feet long; 8 gabions, 10½ feet in diameter, 20 feet long, and 9 burrs. Inside of post circle the grade of this groin is 2 feet above standard low water.

The construction of Groin No. 2 was commenced April 18 and completed May 4. Eight gabions 10½ feet in diameter, 30 feet long, and 8 gabions 10½ feet in diameter, 20 feet long, were used.

Work on Groin A was begun April 22 and completed May 6. Eight burrs, 94 fascines, averaging 3½ feet in diameter, 20 feet long; 30 cords of brush in bundles and 11 cubic yards of stone were used in its construction.

Groin B was commenced April 28 and completed May 24. Two gabions, 10½ feet in diameter, 30 feet long; 7 gabions, 10½ feet in diameter, 20 feet long; 90 cockleburs, 191 fascings, averaging 3½ feet in diameter, 20 feet long; 49 cords of brush in bundles, and 10 cubic yards of stone were used in its construction.

In addition to the above groins a short groin or spur was built on Radial No. 6 from the bank to the base of the upper cone, having the same lines in cross section as the bankhead. And with a view of causing a fill between Groins Nos. 1 and 2, or developing the cause of failure to fill, a connecting groin was built between Nos. 1 and 2, distant 125 feet from the post circle.

The former was begun on May 11 and completed on the 15th of that month. There were used in its construction 25 fascines, averaging 3½ feet in diameter, 20 feet long, together with 14 cords of brush and 21 cubic yards of stone.

The connecting groin was commenced and completed on May 25, expending one gabion 10½ feet in diameter, 30 feet long, and 10 burrs.

The effect of these groins on the flow at the bankhead was marked. The eddy in the bight above the bankhead and the great eddy in front of it, both of which were violent during the flood, were quickly quieted down and finally became exceedingly mild, but because these phenomena attended a falling river it was thought best to provide against a possible return of the eddies during flood, and for this reason, and with a view of causing deposits that would cheapen the cost of building a proposed pile work extension of the bankhead upstream, Groin C and the short line of abatis above it were projected.

The abatis was located at a point on the right bank 500 feet above the shore end of Groin B. It was built in three sections, aggregating 103 feet in length on a line making an angle of about 60 degrees with the trend of the shore above it. The grade of the tops of the poles slope from 15 feet above standard low water at the shore to 2 feet above at the outer end. The work was commenced June 6 and completed June 10.

The center line of Groin C is radial to a 1,000-foot circle which is tangent to the post circle at Bankhead Radial No. 6, and makes an angle of 23 degrees upstream from Radial No. 6. The groin was to be built on a woven foot mattress and to extend from the shore 270 feet into the stream. The construction of the groin was commenced immediately after the completion of the abatis, and completed in accordance with the plans June 17. The foot mattress, 90 feet wide and 280 feet long, was placed that its upstream edge was 30 feet above center line of the groin. After the mattress was sunk, 81 burrs and 7 gabions, 10½ feet in diameter, 30 feet long, were placed, building the groin up to grade.

A single row curtain, supported upon piles spaced 10 feet apart, was built on the 922-foot circle of the proposed extension to the bankhead, extending from the right bank 122 feet down to a point 15 feet above the center line of Groin C, and thence inshore 50 feet to a connection with the bank on a line parallel to the center line of the groin. The elevation of the top of this curtain is 20 feet above standard low water.

Bankhead 6 F, repairs.—The old pile of waste earth on the bankhead front was degraded with slip scrapers to the general elevation of the bank above the structure—23 feet above standard low water—requiring the removal of 624 cubic yards of earth. This material was utilized as far as possible in restoring the upper cone immediately above and below Groin A. The upper cone from Radial No. 6 to Radial No. 9, which was destroyed during the April rise, was restored with earth and repaved. The upper cone, from Radial No. 6 to Radial No. 38, was graded out from top of paved slope—elevation 19½ feet above standard low water—to top of the bank, and 84 cubic yards of spawls were expended in covering 5,200 square feet of paving on upper cone between the elevations of 10 feet and 19½ feet above standard low water.

The cost of this work is shown in detail in the Appendix, Exhibit Q.

For the greater part of the year the main flow of the river has entered Howards Bend at its head above Bankhead 4 F, and passed that structure and Bankhead 5 F in a direction so nearly parallel to the shore that there was little disturbance caused to bankheads or bank. There has been an apparent tendency to increase in the relative volume of discharge to the north of Catfish Island. The head of the island caved rapidly during the long April flood, and continued to cut during the lower stage that intervened between the April and June rises. The last survey, of June 27 to 28 (see accompanying map, Pl. V), shows the head to have moved downstream 620 feet since the survey of February 22. Discharge observations, roughly taken June 3, indicated that approximately 35 per cent of the volume of flow passed to the north of the island, and of the remaining 65 per cent, as much as 50 per cent passed between the island and the bar in front of the bankhead. Mr. Turner, who made the survey of June 27–28, stage 10.90 above standard low water, reports a very mild flow past the Bankhead 6 F, and a swift current beyond the opposite bar—between the bar and the island.

PELICAN BEND.

Revetment.—See accompanying map (Pl. VI) and two photographic views (Pls. XLVIII and XLIX). In compliance with instructions I prepared and submitted, under date of July 22, a project for the expenditure of the allotment of $45,000 for this work by the construction in Pelican Bend of 6,330 linear feet of revetment, the upper end of the work to be at a point that corresponds to point marked A′ on the map. In a letter dated August 15 you transmitted a blue print of the map, which accompanied my project above referred to, showing location of upper end of approved work at point 1,000 feet lower down, shown on the map at A.

Work was commenced August 15, and when finally suspended in December 8, 6,450 linear feet of continuous revetment had been completed in accordance with standard specifications, except that the spawling of 5,729 linear feet of the upper-bank pavement had been omitted. The cost of this work was $29,530.51 or $4.57+ per linear foot, as shown in detail in the Appendix, Exhibit R. The time of completion of the work was delayed and its cost greatly increased by the failure of the stone contractor to make deliveries commensurate with the requirements. The estimated cost of covering with spawls the balance of the upper bank work is $1,856, which, added to the cost of work as shown above, would make the average cost of revetment $4.87— per linear foot. In a letter dated June 14 you notified me of the approval by the Chief of Engineers of your project for the expenditure of $100,000 for work at Pelican Bend, appropriated in the urgency deficiency bill of January 5, 1899. After providing an item of $12,000 for the construction of some new barges at the Gasconade boat yard and $8,000 for general office and traveling expenses, $80,000 are to be expended in extending the revetment 1,000 feet upstream from the existing revetment, and as far downstream from the end of the existing revetment as the funds will permit. Altogether it is expected to build from 9,000 to 10,000 feet of revetment.

Preliminary measures in the way of preparation of floating plant, locating and contracting for requisite brush on stump have been made, and an effort is being made to secure a suitable quarry from which to procure by hired labor the stone ballast that will be required. In this way it is hoped to avoid a repetition of the troubles and delays experienced last year with contractors.

It is proposed to commence the new work as soon as the river falls to a suitable working stage.

PROCURING CONSTRUCTION MATERIALS.

Stone.—During the year 7,266 cubic yards of stone were procured by hired labor. Of this amount, 4,282 cubic yards were procured on Little Blue Reach; 77 cubic yards for work at Huntsdale; 2,637 cubic yards for repairing and remodeling bankheads in Howards Bend, and 70 cubic yards for Pelican Bend revetment. There were acquired by purchase in open market on ten days' proposals 23,917.43 cubic yards of stone. This amount was distributed among the different reaches in quantities as follows:

Miami Reach:
  1,343.31 cubic yards, at 94 cents, delivered by contractors, Matt & Roberts, on barges near Miami, Mo.
Glasgow Reach:
  7,601.82 cubic yards, at 89 cents, delivered by contractors, Matt & Roberts, on barges near New Frankfort, Mo.
Rocheport Reach:
  1,445.04 cubic yards, at $1, delivered by contractor, J. W. Thompson, by wagon at point of expenditure.
Pelican Bend Reach:
  5,570.38 cubic yards, at 69 cents, delivered by contractor, J. W. Thompson, on barges at Musics Ferry.
  4,639.30 cubic yards, at 76 cents, delivered by St. Louis, Keokuk and Northwestern Railway Company on cars at Texas Junction, Mo.
  3,164.81 cubic yards, at 66 cents, delivered by St. Louis, Keokuk and Northwestern Railway Company on cars at Texas Junction, Mo.
  19.44 cubic yards (spawls), at 73 cents, delivered by St. Louis, Keokuk and Northwestern Railway Company on cars at Texas Junction, Mo.
  133.33 cubic yards (spawls), at 61 cents, delivered by St. Louis, Keokuk and Northwestern Railway Company on cars at Texas Junction, Mo.

In asking for proposals for stone this year, it was provided that measurements by displacement should govern instead of superficial measurements as heretofore; 2,500 pounds was assumed as the weight of a cubic yard of stone, as ordinarily piled for measurement, and taken as a basis for computation of quantities. This proved to be a close average of the actual weights of stone furnished, and the new method worked very satisfactorily, causing complaint, and that without just cause, from only one contractor.

Brush and poles.—All material of this class was procured by hired labor as needed. A total of 6,960 cords was procured for the different localities, as follows: Little Blue Reach, 1,238.45 cords; Miami Reach, 243.66 cords; Glasgow Reach, 1,145.06 cords; Huntsdale Reach, 63 cords; Howards Bend Reach, 933.50 cords; and Pelican Bend Reach, 3,384.36 cords.

Piling and lumber.—This class of material was purchased in open market, as required. In all, 154,115 feet B. M. of lumber and 36,563 linear feet of piling were procured for the different locations, as follows: Little Blue Reach, 25,695 feet B. M. of lumber and 7,758 linear feet of piling; Miami Reach, 7,568 feet B. M. of lumber and 6,386 feet of piling; Glasgow Reach, 110,477 feet B. M. of lumber and 22,424 feet of piling; Huntsdale Reach, 10,405 feet B. M. of lumber; Howards Bend Reach, 48,008 feet B. M. lumber and 1,055 linear feet of piling.

Strand, wire nails, etc., were purchased as usual in the open market.

The cost of construction materials is taken up in the cost exhibits of the various works on which they were expended.

PLANT.

Towboat service.—During the year the U. S. towboat *Alert* and the following steam tenders were in service upon these works: *Sabrina, Arethusa, Atalanta, Melusina*, and chartered steamers *Gasconade, Commodore, J. R. Wells, J. R. Hugo*, and *Peerless*.

The U. S. towboat *Alert* was placed in commission July 25 and on the 26th started up the river from Gasconade boat yard with a tow of 5 hulls for Blue Mills Island. At Miami 3 additional hulls were picked up. Arriving at Blue Mills August 1, the tow was dropped and she returned to Glasgow, arriving there on the 2d, between which date and the 11th 2 tows to Blue Mills Island were made, aggregating 13 hulls, of which 2 were picked up at Miami. She then returned to Gasconade, arriving there on the 14th with 6 hulls picked up at Glasgow, 1 being unserviceable, the others loaded with materials used in construction of temporary ways. Between August 15 and 24, two tows were made from Gasconade boat yard to Pelican Bend, taking down 11 hulls. The boat returned to Gasconade and was laid up in Gasconade River on the 27th of that month. She was again placed in commission October 14, and employed in towing plant from Pelican Bend and Howards Bend to Gasconade boat yard. On the 28th, while under way with an upstream tow, one of the branch steam pipes burst, fortunately without fatal injury to any of her crew, although the engineer was painfully scalded and bruised and her watchman blown overboard. After making the necessary repair she proceeded up the river with a somewhat lightened tow, arriving at Gasconade November 5. She was laid up in ordinary in Gasconade River on the 6th. In all, 3 tows had been made, aggregating 17 hulls.

The *Sabrina* was placed in commission on July 22 and cleared from Gasconade boat yard on the same day with a 64-foot barge in tow for Blue Mills Island, adding 2 hulls to her tow at Miami. She reached her destination July 30. For the next sixty-two days she was employed on Little Blue and Miami reaches, handling plant, towing material to points of expenditure, and doing dispatch work. She was finally relieved, and cleared on September 29 for Gasconade, where she arrived the following day.

The *Arethusa* was placed in commission August 7, and for the next ninety-six days was employed on Pelican Bend and Howards Bend reaches, towing plant from Gasconade boat yard to Pelican Bend and return, from Pelican Bend to Howards Bend, moving construction parties, towing materials to points of expenditures, and doing dispatch work. The boat returned to Gasconade boat yard November 10 and was laid up. On the 18th she was again placed in commission and started up the river for service on Glasgow Reach. Between the latter date and March 27 she was in service fifty-one days, handling and shifting plant and performing such service as was required in connection with repair work on Glasgow Reach. On March 27 she was cleared for Gasconade boat yard with a pile driver and tow, both pieces being in need of repair. The necessary repairs having been made, the tender cleared from Gasconade boat yard on April 25 with 2 hulls for Howards Bend and was retained in service on that work until June 18, when she was relieved and cleared light for Gasconade boat yard. Thereafter to the close of the year she was employed towing plant to Rocheport for use on that work, handling construction materials and doing dispatch work.

The *Atalanta* was transferred from Omaha division for use on local works below Kansas City, and cleared from Bonton Bend August 27 for Little Blue Reach. The trip developed the need of some repairs, and she was sent on through to the Gasconade boat yard, after picking up 3 hulls at Blue Mills Island and delivering them at Miami. The necessary repairs having been completed, she cleared for Miami on September 10 with a 100-foot barge in tow loaded with tools and materials, and was in service seventy-five days on Miami and Glasgow reaches. The tender arrived at Gasconade boat yard on November 22 with a pile driver and a 64-foot barge in tow and was laid up for the winter. She was placed in commission again March 21, and and she cleared on that day with 2 pile drivers and a small quarter boat in tow for Glasgow. She was retained in service on Glasgow and Little Blue reaches until the end of the fiscal year, handling plant, towing materials to points of expenditure, and doing dispatch work.

The *Melusina* was placed in commission on April 11, and until the 27th was in service, towing plant from Gasconade boat yard to Howards Bend, and in performing such service as was required of her on that work. Three tows were made, aggregating 10 hulls. On May 17 the boat cleared from Gasconade boat yard for Little Blue Reach with a pile driver and a 64-foot barge with cabin in tow. She was in service upon Little Blue and Glasgow reaches until June 25, when she was laid up in ordinary, with the plant moored along left bank above Dike 2 A.

The steamer *Gasconade* was chartered at Jefferson City August 12, at $25 per day, and on the next day cleared for Gasconade boat yard with a 100-foot barge loaded with lumber, piles, tools, and supplies for Blue Mills Island. For one hundred and six days she was employed on Little Blue, Miami, and Glasgow reaches in towing lumber and piles from contractor's camps to points of expenditure, handling and moving plant from one reach to another, and performing any other service required of her. She was finally released November 25.

The steamer *Commodore*, in the absence of other tenders, was chartered on September 20 to relieve 2 grounded stone barges and again on the 23d of the same month to tow a barge of stone from the quarry landing to Bankhead 1 D, at a cost of $5 for each barge handled.

The steamer *J. R. Wells* was chartered at Osage City on October 17, at $20 per day, and cleared for Little Blue Reach with a 100-foot barge in tow loaded with tools, materials, and supplies. She was retained in service on that work thirty-seven days, being employed in towing materials for the construction of a groin at Bankhead 3 A. She was relieved November 22.

The chartered steamer *John R. Hugo* was employed three and one-half days, May 20 to 23, in moving 10 hulls from Leavenworth, Kans., to Blue Mills Island.

The steamer *Peerless* was chartered at Hermann, Mo., June 21, at $25 per day, and employed in towing a barge of piles from Gasconade and lumber from Bonnots Mill supply yard to Bankhead 1 D above Rocheport, and in performing other service required. After six days' service she was relieved on the 26th.

Repairs to plant.—The larger part of the plant on these works was repaired in the boat yard at Gasconade and a statement of the extent and cost of the work is given in my annual report of this year for Gasconade division, to which I beg leave to refer. The preparation was begun July 6 for active service of those hulls which were retained on the detached works. The rakes and sides of 9 100-foot barges, 9 64-foot barges, 4 of which contained cabins, 1 double-decked quarter boat, 12 skiffs, and 2 pontons were calked above light load line and other necessary repairs made. During the month of March and before the resumption of active operations in the spring the following hulls which had been wintered at Dike 3 C were gotten ready for the season by calking sides and rakes above light load line and doing such other work on them as seemed necessary and sufficient:

100-foot barges	11
64-foot barges	3
64-foot barges with cabins	5
Double-decked quarter boat	1

Additional repairs were made as follows: A 64-foot barge was fitted up with new ways to be used as a mattress boat for dike work; 2 skiffs and 3 dike mat pontons were repaired; 2 quarter boats previously used as store boats were fitted up with quarters; the decks of 3 100-foot barges were sheathed and new canvass roofs placed upon 2 cabin pieces.

Care of plant.—Upon suspension of operations, on account of heavy floating ice during the latter part of November, all floating plant that could possibly be handled was assembled along the right bank immediately below Dike 3 C. Four 100-foot barges at the New Frankfort quarry landing could not be reached until the river was sufficiently clear of ice for the steam tender to handle them. Three of them were moved down under Dike 3 C in December, but it was not until January 10 that the last one could be towed down and tied up with the remainder of the fleet.

This fleet consisted of the following hulls:

100-foot barges	11
64-foot barges	3
64-foot barges, with cabins	5
Pile driver	1
Double-decked quarter boat	1
Steam tender *Arethusa*	1

A regular force of five watchmen were retained in care of this fleet, but during the month of February, when the safety of the plant was threatened on account of the breaking up of the ice, an extra force was put on.

On account of the high stage of water during the month of April, all the plant was moved from under Dike 3 C to left bank above Bankhead 4 C for safety during the flood.

In June, when work was suspended on Little Blue Reach on account of high stage of water, all floating plant was assembled along the left bank above Dike 2 A and left in charge of four watchmen. This fleet consists of the following hulls:

100-foot barges	5
64-foot barges (one with cabin)	2
Steam pile drivers	2
Quarter boats	2
Tender *Melusina*	1

Loss of barges.—On October 31, 100-foot barge No. 49, loaded with stone, sprung a leak and sank while in tow of steamer *J. R. Wells*. The barge was raised on November 3. Again, on November 10, the same barge, while loaded with stone and in tow of the *Wells*, struck a snag in the crossing above Dike 2 A and sunk. Upon examination it was concluded that the probable cost of recovery would greatly exceed the value of the barge, and so it was abandoned after removing all but 40 cubic yards of the load of stone. On November 9, while under way loaded with stone and in tow of *Atalanta*, 100-foot barge No. 134 struck a snag in the New Frankfort crossing and was beached to prevent sinking. The barge was unloaded, temporarily repaired, and subsequently sent by Gasconade boat yard to be pulled out.

SURVEYS.

Hydrographic and shore-line surveys were made on all the reaches except Miami where improvement works were carried on or proposed. Shore-line surveys were also made, between March 25 and April 9, of the three new reaches, for which provision was made by allotment from the appropriation for Missouri River in the sundry civil act of March 3, 1899, viz: At Randolph Bend, Mo.; Lexington, Mo., and Nigger Bend, Mo. These latter surveys were made with a view of securing recent information for use in preparing projects and estimates of cost for improvement.

In addition to the above, and other survey work ordinarily incident to river construction, such as the location of improvement works, giving grades, etc., numerous special surveys and examinations were made from time to time, and a great deal of data concerning conditions of flow at and near the bankheads secured.

The cost of this work during the year was $2,111.06.

Very respectfully, your obedient servant,

S. WATERS FOX,
Division Engineer.

Lieut. Col. AMOS STICKNEY,
Corps of Engineers, U. S. A.,
President Missouri River Commission.

LIST OF EXHIBITS FORMING THE APPENDIX TO FOREGOING REPORT.

A.—Classified statement of expenditures special and suballotments.
B.—Elements of work and cost, in detail, of alterations, etc., Bankhead 3 A.
C.—Bill of cost of stone procured on account of Bankhead 1 A.
D.—Elements of work and cost, in detail, on account of construction Dike 2 A.
E.—Elements of work and cost, in detail, on account of restoration Dike 2 A.
F.—Elements of work and cost, in detail, on account of extension Dike 1 B.
G.—Elements of work and cost, in detail, on account of remodeling 1 B.
H.—Elements of work and cost, in detail, on account of remodeling, etc., Bankhead 6 C.
I.—Elements of work and cost, in detail, on account of construction Dike 3 C.
J.—Elements of work and cost, in detail, on account of remodeling, etc., Bankhead 5 C.
K.—Elements of work and cost, in detail, on account of construction Bankhead 2 C.
L.—Elements of work and cost, in detail, on account of repairs to Cambridge Bend revetment.
M.—Elements of work and cost, in detail, on account of construction abatis below Dike 3 C.
N.—Elements of work and cost, in detail, on account of remodeling, etc., Bankhead 1 D.

O.—Elements of work and cost, in detail, on account of construction Abatis A and B, Huntsdale Reach.

P.—Elements of work and cost, in detail, on account of repairs to Bankheads 4 F and 5 F.

Q.—Elements of work and cost, in detail, on account of remodeling, etc., at Bankhead 6 F.

R.—Elements of work and cost, in detail, on account of construction Pelican Bend revetment.

EXHIBIT A.

Classified statement of money expenditures under the special and suballotments for detached works below Kansas City, Mo., during fiscal year ending June 30, 1899.

Classification.	Special allotment Little Blue.	Special allotment Glasgow.	Special allotment Huntsdale.	Special allotment Pelican Bend.	Local works below Kansas City.	Total.
Actual expenditure on account of construction work for labor and materials	$6,268.80	$12,165.09	$925.18	$29,106.80	$21,272.66	$69,738.53
Towboat service while directly engaged in construction	939.42	2,465.88	....	3,413.26	3,396.45	10,215.01
Total	7,208.22	14,630.97	925.18	32,520.06	24,669.11	*a* 79,953.54
All other plant service, including repairs, watching, and moving from place to place	416.94	3,200.17	....	7,117.05	2,284.52	*b* 13,018.68
Administration charges:						
St. Louis office	500.00	965.00	485.40	3,938.36	....	5,888.76
Jefferson City and field	315.00	1,944.19	986.88	7,320.05	2,422.77	12,988.89
Total	815.00	2,909.19	1,472.28	11,258.41	2,422.77	*c* 18,877.65
All other charges:						
New plant	....	246.21	....	916.24	.80	1,163.25
Surveys	127.54	419.59	23.18	277.83	76.34	924.48
Telegrams, etc	3.38	7.53	.20	23.61	17.50	52.22
Traveling expenses	189.92	164.97	47.50	494.14	416.76	1,313.29
Freight charges	33.80	29.80	2.72	44.28	66.54	177.14
Total	354.64	868.10	73.60	1,756.10	577.94	*d* 3,630.38
Grand total	8,794.80	21,608.43	2,471.06	52,651.62	29,954.84	115,480.25

a About 69 per cent of grand total expenditures.
b About 12 per cent of grand total expenditures.
c About 16 per cent of grand total expenditures.
d About 3 per cent of grand total expenditures.

EXHIBIT B.

Elements of work and cost, in detail, of alterations, maintenance, and repairs to Bankhead 3 A, Little Blue Reach, from July to November, 1898.

Classification and extent.	Cost in item.	Totals.
Pile work:		
Piles, cottonwood, 1,930 linear feet	$124.59	
Coal and supplies	10.00	
Labor	58.77	
		$193.36
Bracing and curtaining:		
Lumber, 3,329 feet B. M., cottonwood	54.99	
Poles, 20.3 cords, at $2.045	41.51	
Strand, ⅜-inch and ¾-inch	14.21	
Other fastenings, etc	18.50	
Labor	113.87	
		243.08
Weaving mattress:		
Poles, 3.25 cords, at $2.045	6.65	
Brush, 84 cords, at $1.39	117.15	
Strand, ⅜-inch	39.10	
All other fastenings	1.25	
Labor	143.11	
		307.26
Ballasting mattress:		
Stone, 90.44 cubic yards, at $1.30	117.50	
Labor	16.07	
		133.57
Paving upper slope:		
Stone, 1,541 cubic yards, at $1.30	2,002.70	
Labor	1,822.10	
		3,824.80
Excavation, labor (5,600 yards)	1,343.30	1,343.30
Building drainage levee, labor	101.91	101.91
Constructing groins:		
Brush, 231.78 cords, at $1.39	323.64	
Stone, 60 cubic yards, at $1.30	77.94	
Labor	295.14	
		696.72
Constructing spurs:		
Materials	9.00	
Labor	318.88	
		327.88
Subsistence	608.17	608.17
Total		7,780.05

EXHIBIT C.

Bill of cost of stone procured on account of Bankhead 1 A, Little Blue Reach, during August, September, and October, 1898.

Classification and extent.	Cost in item.	Total.
Procuring rock (2,070.04 cubic yards):		
Labor	$1,319.26	
Quarry privilege	11.74	
Quarry supplies, powder, etc	211.66	
		$1,542.66

EXHIBIT D.

Elements of work and cost in detail of Dike 2 A, Little Blue Reach, constructed during the months of August and September, 1898.

Classification and extent.	Cost in item.	Total.
Pile work:		
Piles—		
Cottonwood (old), 2,850 linear feet, at $0.0964 per linear foot	$274.74	
Cottonwood (old), 4,536 linear feet, at $0.1164 per linear foot	527.99	
Cottonwood (new), 3,446 linear feet, at $0.058 per linear foot	199.87	
Pine (old), 5,014 linear feet, at $0.058 per linear foot	138.15	
Handling piles, labor	113.84	
Labor	322.76	
		$1,577.35
Bracing:		
Materials—		
Cottonwood lumber (old), 16,661½ feet B. M., at $18.67 per M	311.07	
Cottonwood lumber (new), 21,926⅜ feet B. M., at $14.00 per M	306.97	
Handling lumber	100.51	
Bolts, washers, spikes, etc	254.21	
Handling bolts, etc	17.45	
Strand	535.38	
Labor	701.30	
		2,226.89
Mattress weaving:		
Brush, 527.3 cords, at $1.39 per cord	736.28	
Poles, 7 cords, at $2.045 per cord	14.32	
Strand	204.12	
Spikes, etc	4.41	
Labor	572.44	
		1,531.57
Ballasting mattress:		
Stone, 720.52 cubic yards	861.34	
Labor	205.80	
		1,067.14
Curtaining:		
Strand	.70	
Spikes, etc	4.41	
Poles, 38 cords, at $2.045 per cord	77.71	
Labor	123.85	
		206.67
Subsistence stores, handling, etc		1,190.42
Total		7,800.04

EXHIBIT E.

Elements of work and cost in detail of restoration of Dike 2 A, Little Blue Reach, during months of May and June, 1899.

Classification and extent.	Cost in item.	Total.
Pile work, sheer dike:		
Materials and supplies—		
2,040 linear feet cottonwood piling, at 5⅘ cents per linear foot	$118.32	
95 bushels coal, at $0.095 +	9.05	
Hardware, bolts, spikes, etc	3.65	
Labor and subsistence—		
Driving and bolting 45 piles [a]	167.26	
Handling, barging, etc	27.36	
		$325.64
Pile work, Dike 2A:		
Materials and supplies—		
3,062 linear feet cottonwood piling, at 5⅘ cents per linear foot	177.60	
170 bushels coal, at $0.095+	16.20	
Labor and subsistence—		
Driving 45 piles [b]	133.27	
Driving 25 anchor piles [c]	142.61	
Handling, barging, etc	41.79	
		511.47

[a] 21 piles scoured out or broken off.

[b] 15 piles scoured out or broken off and 2 drawn.

[c] 13 piles scoured out or broken off.

EXHIBIT E.—*Elements of work and cost in detail of restoration of Dike 2 A, Little Blue Reach, during months of May and June, 1899*—Continued.

Classification and extent.	Cost in item.	Total.
Foot mattress (65 linear feet, or 4,160 square feet):		
Materials and supplies—		
25 cords brush (procured by hired labor), at $2.03+ per cord	$50.81	
1,145 feet ⅜-inch galvanized wire strand	9.58	
14 clips, at 5½ cents	.77	
50 cubic yards stone (procured by hired labor), at $0.659+	32.99	
Labor and subsistence—		
Weaving	101.84	
Ballasting	13.95	
Handling and barging stone	14.78	
		$224.72
Steamboat service:		
Labor and subsistence	685.63	
1,766¾ bushels coal, at $0.095+	168.34	
Labor and subsistence, handling coal	46.95	
		900.92
Total		1,962.75

EXHIBIT F.

Elements of work and cost in detail of extension of Dike 1 B, Miami Reach, constructed during the months of September and October, 1898.

Classification and extent.		Cost in item.	Total.
Pile work:			
Piles—			
Cottonwood (old), 60 linear feet, at $0.0914 per linear foot		$5.48	
Cottonwood (new), 496 linear feet, at $0.058 per linear foot		28.77	
Pine (old), 1,866 linear feet, at $0.1964 per linear foot		366.48	
Pine (new), 1,854 linear feet, at $0.17 per linear foot		315.18	
Handling materials—			
Piling	$110.00		
Coal	33.89		
		143.89	
Labor		88.49	
			$948.29
Bracing:			
Lumber—			
Pine (old), 3,816 feet B. M., at $24.27 per M		92.61	
Pine (new), 2,640 feet B. M., at $33 per M		87.12	
Cottonwood (new), 2,156 feet B. M., at $10 per M		21.56	
Bolts, washers, spikes, etc		51.64	
Strand		126.66	
Handling materials—			
Lumber	$67.58		
Strand	28.74		
Bolts	3.25		
		99.57	
Labor		165.93	
			645.09
Weaving mattress:			
Brush, 146.07 cords, at $1.39 per cord		203.96	
Poles, 2 cords, at $2.045 per cord		4.09	
Labor		168.79	
			376.84
Ballasting mattress:			
Stone, 189.05 cubic yards, at $1.127 per cubic yard		203.06	
Handling stone		76.09	
Labor		20.65	
			299.80
Curtaining:			
Poles, 18 cords, at $2.045 per cord		40.41	
Spikes, 60d, 73 pounds, at $0.0175 per pound		1.28	
Labor		35.10	
			76.79
Subsistence stores, labor, handling, etc		265.43	265.43
Total			2,612.24

EXHIBIT G.

Elements of work and cost in detail of remodeling and extending Bankhead 1 B, Miami Reach, during the month of September, 1898.

Classification and extent.		Cost in item.	Total.
Pile work:			
Piles—			
Cottonwood (new), 674 linear feet, at $0.058 per linear foot		$39.09	
Cottonwood (new), 3,352 linear feet, at $0.058 per linear foot		194.42	
Cottonwood (old), 30 linear feet, at $0.0914 per linear foot		2.74	
Handling materials—			
Piling	$86.93		
Coal	30.00		
		116.93	
Labor		180.88	
			$533.56
Bracing:			
Lumber—			
Cottonwood (new), 322½ feet B. M., at $10 per M		3.23	
Cottonwood (new), 1,716 feet B. M., at $14 per M		24.02	
Cottonwood (old), 144 feet B. M., at $18.67 per M		2.69	
Pine (old), 88 feet B. M., at $24.27 per M		2.14	
Bolts, spikes, etc		18.91	
Handling materials		17.80	
Labor		100.90	
			169.69
Placing brush and stone:			
Brush, 41.6 cords, at $1.39 per cord		58.09	
Poles, 1 cord, at $2.05 per cord		2.05	
Spikes		.47	
Stone, 70 cubic yards, at $0.94 per cubic yard		65.80	
Wire, 74 pounds, at $0.0239 per pound		1.77	
Labor		56.69	
			184.87
Curtaining:			
Poles, 3.3 cords, at $2.045 per cord		6.75	
Spikes		.47	
Labor		16.19	
			23.41
Excavation—labor (207 cubic yards)		64.25	64.25
Ballasting:			
Stone (new), 1,273.31 cubic yards, at 94 cents per cubic yard		1,196.91	
Labor, removing old and replacing new stone		695.56	
			1,892.46
Subsistence stores, labor, handling, etc			302.57
Total			3,170.81

EXHIBIT H.

Elements of work and cost in detail of remodeling, extending, etc., Bankhead 6 C, Glasgow Reach, during the fiscal year ending June 30, 1899.

Classification and extent.	Cost in item.	Total.
Remodeling structure:		
Ballasting—		
1,581.17 cubic yards stone, acquired during the year, at 89 cents	$1,407.24	
640 cubic yards stone, acquired during fiscal year, at $1.16	744.55	
Labor	633.57	
Removing and placing stone in structure	419.25	
Placing new stone	82.96	
		$3,287.57
Excavation:		
Labor, removing 7,085 cubic yards	1,239.37	1,239.37
Subsistence, handling stone, etc	109.30	109.30
Groin construction (cockleburs—making and placing 196, 8 square feet by 4 feet deep):		
Materials—		
Brush, 116¾ cords, stumpage	11.64	
Stone, 391.38 cubic yards, procured by contract	348.33	
Lumber, cottonwood	155.00	
Lumber, oak, for pins	9.34	
Wire and strand	106.81	
Rope, manila	4.50	
Towage	130.12	
Labor and subsistence	1,126.12	
		1,891.86
Gabions (making and placing 38—34, 10½ feet diameter by 30 feet long; 1, 9½ feet diameter by 30 feet long; 2, 8 feet diameter by 30 feet long; 1, 4 feet diameter by 30 feet long):		
Materials—		
Brush, 135¼ cords, stumpage	13.52	
Stone, 432.12 cubic yards, procured by contract	376.57	
Lumber, cottonwood	91.16	
Lumber, elm	55.44	
Pins and wedges	44.09	
Wire stand and clips	82.09	
Towage	443.28	
Labor and subsistence	1,151.57	
		2,257.72
Fascines (making and placing 77—65, 4 feet diameter by 30 feet long; 12, 3 feet diameter by 18 feet long):		
Materials—		
Brush, 113 cords, stumpage	11.30	
Stone, 135.87 cubic yards, procured by contract	120.92	
Lumber, cottonwood	2.19	
Wire and nails	9.34	
Towage	50.39	
Labor and subsistence	418.52	
		612.66
Levee (constructing 920 linear feet, containing 2,342 cubic yards of earth), labor and subsistence	453.70	453.70
Abattis (constructing 130 linear feet):		
Materials—		
Brush, 30 cords, stumpage	3.60	
Stone, 60 cubic yards, procured by contract	53.40	
Piling, cottonwood, 408 linear feet	24.48	
Lumber, cottonwood, 4,596 feet B. M	55.15	
Bolts and washers	15.29	
Nails and spikes	4.17	
Wire strand and clips	87.54	
Supplies	3.50	
Towage	222.50	
Labor and subsistence	332.64	
		802.27
Total	....	10,654.45

EXHIBIT I.

Elements of work and cost in detail of Dike 3 C, Glasgow Reach, constructed during the months of October and November, 1898.

Classification and extent.	Cost in item.	Total.
Pile work:		
Piles—		
Cottonwood (new), 4,498 linear feet, at 5 cents per linear foot	$224.90	
Cottonwood (new), 3,746 linear feet, at 6 cents per linear foot	224.76	
Labor	236.02	
		$685.68
Bracing:		
Lumber—		
Cottonwood (new), 17,703 feet B. M., at $10 per M	177.03	
Cottonwood (new), 5,632 feet B. M., at $14 per M	78.85	
Cottonwood (old), 656 feet B. M., at $18.67 per M	12.25	
Pine (old), 144 feet B. M., at $24.27 per M	8.50	
Bolts, spikes, etc	136.29	
Strand	261.24	
Labor	435.20	
		1,109.36
Mattress weaving:		
Brush, 231.82 cords	323.70	
Poles, 5 cords	10.23	
Spikes and clips	2.23	
Labor	414.70	
		750.86
Ballasting mattress:		
Stone, 608.1 cubic yards, at 89 cents	541.21	
Labor	159.35	
		700.56
Curtaining:		
Poles, 48.72 cords, at $2.045	99.63	
Spikes	8.08	
Labor	161.76	
		269.47
Constructing levee across slough	79.66	79.66
Handling materials:		
Piling	58.75	
Lumber	86.86	
Coal	18.13	
		163.74
Subsistence, labor, handling, etc	224.09	224.09
Total		3,983.42

EXHIBIT J.

Elements of work and cost in detail of remodeling, extending, etc., Bankhead 5 C, Glasgow Reach, during fiscal year ending June 30, 1899.

Classification and extent.	Cost in item.	Total.
Storing 90.35 cubic yards stone and making preparations for continuing work at this structure	$133.75	$133.75
Groin construction (cockleburs, making and placing 24, 8 feet square by 4 feet deep):		
Materials and supplies—		
Brush, 17½ cords, stumpage	1.75	
Stone, 57.65 cubic yards, by contract	51.31	
Lumber, cottonwood	15.79	
Pins and wedges	2.30	
Wire	3.24	
Towage	29.15	
Labor and subsistence	135.09	
		238.63
Gabions (making and placing 10, 10½ feet diameter by 30 feet long):		
Materials—		
Brush, 29½ cords, stumpage	2.92	
Stone, 98 cubic yards, procured by contract	87.22	
Lumber, cottonwood	45.19	
Pins and wedges	12.91	
Strand, wire, nails	42.44	
Towage	48.29	
Labor and subsistence	332.19	
		571.16

EXHIBIT J.—*Elements of work and cost in detail of remodeling, extending, etc., Bankhead 5 C, Glasgow Reach, during fiscal year ending June 30, 1899*—Continued.

Classification and extent.	Cost in item.	Total.
Fascines (making and placing 36, 4 feet diameter by 30 feet long):		
Materials—		
Brush, 65 cords, stumpage	$6.50	
Stone, 104.35 cubic yards, procured by contract	92.87	
Wire	8.51	
Towage	67.37	
Labor and subsistence	211.75	
		$387.00
Levee (60 linear feet, containing 160 cubic yards of earth), labor and subsistence	26.38	26.38
Construction of new outer circle:		
Materials—		
Piling, cottonwood, 1,438 linear feet	86.28	
Coal	3.50	
Towage	44.95	
Labor and subsistence	103.48	
		238.21
Total		1,595.13

EXHIBIT K.

Elements of work and cost in detail of construction of Bankhead 2 C, Glasgow Reach, during the months of October and November, 1898.

Classification and extent.	Cost in item.	Total.
Pile work:		
Piles—		
Cottonwood (new), 1,730 linear feet, at $0.058 per linear foot	$100.34	
Cottonwood (new), 1,724 linear feet, at $0.05 per linear foot	86.20	
Cottonwood (new), 982 linear feet, at $0.06 per linear foot	58.92	
Cottonwood (old), 330 linear feet, at $0.0916 per linear foot	30.16	
Labor	238.70	
		$514.32
Bracing:		
Lumber—		
997 feet B. M. (new), at $10 per M	9.97	
1,951 feet B. M. (new), at $14 per M	27.31	
Bolts, spikes, etc	10.81	
Labor	71.65	
		119.74
Placing brush and stone in outer wall:		
Brush, 168.01 cords, at $1.39	150.82	
Poles, 1 cord, at $2.045	2.05	
Stone, 304.35 cubic yards, at 89 cents	270.87	
Spikes	1.75	
Labor	144.02	
		569.51
Curtaining:		
Poles, 17.11 cords, at $2.045	34.99	
Spikes	3.33	
Labor	54.75	
		93.07
Excavation and grading: Labor, 2,884 cubic yards		643.03
Ballasting:		
Stone, 2,616.29 cubic yards, at 89 cents	2,328.50	
Labor	577.00	
		2,905.50
Handling materials:		
Piling	274.92	
Lumber	58.83	
Coal	40.94	
		374.69
Subsistence stores, labor, handling, etc		235.06
Total		5,454.92

EXHIBIT L.

Elements of work and cost in detail of repairs to Cambridge Bend revetment, during the months of October and November, 1898.

Classification and extent.	Cost in item.	Total.
Pile work:		
Piles—		
Cottonwood (new), 2,716 linear feet, at 5 cents per linear foot	$135.80	
Labor	95.62	
		$231.42
Bracing:		
Lumber—		
Cottonwood (new), 5,559 feet B. M., at $10 per M	55.59	
Hauling lumber	20.25	
Bolts, washers, spikes, etc	22.81	
Labor	47.91	
		146.56
Weaving mattress:		
Brush, 107.2 cords, at $1.39	149.69	
Poles, 2.3 cords, at $2.045	4.70	
Strand	34.37	
Spikes	1.75	
Labor	198.34	
		388.85
Ballasting mattress:		
Stone, 102.65 cubic yards, at 89 cents	91.36	
Labor	52.38	
		143.74
Curtaining:		
Poles, 19.7 cords, at $2.045 per cord	40.29	
Spikes	.23	
Strand	4.64	
Labor	70.06	
		115.22
Grading—300 cubic yards moved		25.68
Removing stone from point		28.56
Subsistence stores, labor, handling, etc		70.55
Total		1,150.58

EXHIBIT M.

Elements of work and cost in detail of construction of abattis below Dike 3 C, during the month of June, 1899.

Classification and extent.	Cost in item.	Total.
Construction of one section of abattis, 58½ feet long; driving 22 piles for anchorage:		
Materials—		
Brush, 20½ cords, stumpage	$2.08	
Stone, 30 cubic yards (procured by contract)	26.70	
Piles, cottonwood, 1,180 linear feet	70.80	
Lumber, cottonwood, 1,632 feet B. M	19.58	
Bolts and washers	5.53	
Clips and staples	3.90	
Wire and strand	39.80	
Nails and spikes	4.01	
Coal and supplies	15.95	
Towage Labor and subsistence	231.14	
		$477.44

EXHIBIT N.

Elements of work and cost in detail of remodeling, extending, and repairing Bankhead 1 D, Rocheport, Mo., during fiscal year ending June 30, 1899.

Classification and extent.	Cost in item.	Total.
Excavation for berm and slope: 5,989.7 cubic yards of earth, at $0.1811		$778.75
Degrading outer wall: Removing 1,326 cubic yards of stone and placing it outside 315-foot circle, at $0.1214		160.94
Reenforcing outer wall at upper end of structure and extending it 60 feet upstream to a junction with the bank:		
Materials—2,843 cubic yards of stone, at $1.0304	$292.66	
Labor	42.13	
		334.79
Paving new berm and slope:		
Materials—887.6 cubic yards stone, at $1.0304	914.58	
Labor	234.56	
		1,149.14
Subsistence		16.38
Extension and repairs:		
Pile work—		
Materials and supplies—		
3,024 linear feet pine piling, at $0.2093	63.29	
250 linear feet cottonwood piling, at $0.0743	1.86	
64 feet B. M. pine lumber, at $20 per M	1.28	
120 feet B. M. cottonwod lumber, at $14.9553	1.79	
Spikes, nails, bolts, and staples	2.43	
1,200 feet ⅜-inch strand	8.06	
75 bushels coal	6.00	
Labor	139.89	
Subsistence	4.00	
		228.60
Bracing—		
Materials—		
3,136 feet pine lumber, at $20 per M	62.72	
248 feet cottonwood lumber, at $14.9553 per M	3.71	
Nails and bolts	13.62	
Labor	44.75	
Subsistence	2.00	
		126.80
Weaving mattress—		
Materials—		
89 cords willow brush, at $1.51	134.39	
4,000 feet ⅜-inch strand	50.40	
Clips and nails	4.24	
Labor	185.10	
Subsistence	5.00	
		379.13
Sinking mattress—		
Materials—		
75 cubic yards stone, at $1.13	84.75	
Labor	59.81	
Subsistence	3.00	
		147.56
Total		3,322.09

EXHIBIT O.

Elements of work and cost in detail of constructing two lines of Abatis A and B, aggregating 688 linear feet, Huntsdale Reach, December, 1898.

Classification and extent.	Cost in item.	Total.
Materials and supplies:		
8,498 feet B. M. cottonwood lumber	$127.09	
12 cords brush	24.38	
51 cords poles	96.04	
77 cubic yards stone	111.04	
5,479 feet ⅜-inch strand	36.82	
180 pounds nails, 60d	3.73	
35 pounds nails, 30d	2.14	
460 No. 10 x 7 7/16-inch spikes	8.47	
107 No. 9½ x ⅝-inch screw bolts	2.92	
396 No. 8½ x ⅝-inch screw bolts	10.22	
1,006 No. 1⅜-inch washers	2.40	
Labor and subsistence	390.58	$815.83

Average cost per linear foot of abatis, $1,186.

EXHIBIT P.

Elements of work and cost in detail of repairs to Bankhead 4 F and 5 F, Howards Bend Reach, September to November, 1898.

Classification and extent.	Cost in item.	Total.
Bankhead 4 F:		
Reenforcing outer wall—		
175 cubic yards of stone	$225.75	
Labor, placing stone	31.31	
		$257.06
Earth work (replacing 1,400 cubic yards of earth left on ground previous fiscal year): Labor	138.31	138.31
Total cost of repairs to Bankhead 4 F		395.37
Bankhead 5 F:		
Reenforcing outer wall—		
689.14 cubic yards of stone	798.72	
Labor, placing stone	108.16	
		906.88
Earth work (replacing 1,650 cubic yards of earth left on ground previous fiscal year): Labor	152.31	152.31
Total cost of repairs to Bankhead 5 F		1,059.19

EXHIBIT Q.

Elements of work and cost in detail of remodeling, extending, etc., Bankhead 6 F, Howards Bend Reach, from September, 1898, to June, 1899.

Classification and extent.	Cost in item.	Total.
Extension, remodeling, and reenforcing (September to November, 1898):		
Earth work—excavating 11,362 cubic yards of earth, as follows:		
By hydraulic grader—		
1,855 cubic yards making fill back of 90-foot extension.		
7,072 cubic yards grading original structure.		
8,927 cubic yards removed	$126.30	
By slip scrapers and shovels—		
300 cubic yards from lower end of sloping berm.		
1,250 cubic yards removed in forming unpaved slope.		
700 cubic yards earth wasted from ground back of structure, left there from previous fiscal year.		
185 cubic yards moved in clearing berm outside post circle.		
2,435 cubic yards moved by slip scrapers and shovels	349.57	
Total cost of moving 11,362 cubic yards		$475.87
Clearing drift: Labor	60.38	60.38
Reenforcing outer wall, paving berms and slopes, and making 90-foot extension:		
749.81 cubic yards stone expended in reenforcing outer wall.		
1,004 cubic yards expended in paving berms and slopes.		
360 cubic yards expended in making 90-foot extension.		
2,113.81 cubic yards stone, total expended.		
871 cubic yards stone recovered from old structure (labor cost)	84.31	
1,242.81 cubic yards stone (new)	1,567.32	
Labor	628.12	
Total		2,279.75
Total cost remodeling and reenforcing		2,816.00
Groin construction:		
Groin A, length 128 feet—		
80 cockle burs, at $8.80	704.00	
94 fascines, at $4.81	452.14	
30 cords brush, at $2.15	64.50	
11 cubic yards stone, at $1.47	16.17	
Total cost Groin A		1,236.81
Groin B, length 260 feet—		
90 cockle burs, at $8.80	792.00	
2 gabion burs (30 feet), at $68.44	136.88	
7 gabion burs (20 feet), at $55.07	385.49	
191 fascines, at $4.81	918.71	
49 cords brush, at $2.15	105.35	

EXHIBIT Q.—*Elements of work and cost in detail of remodeling, extending, etc., Bankhead 6 F, Howards Bend Reach, from September, 1898, to June, 1899*—Continued.

Classification and extent.	Cost in item.	Total.
Groin construction—Continued.		
Groin B, length 260 feet—Continued.		
10 cubic yards stone, at $1.47	$14.70	
Labor, placing stone and brush	32.95	
Total cost Groin B	....	$2,386.08
Groin C, length 234 feet—		
81 cockle burs, at $8.80	712.80	
7 gabion burs (30 feet), at $68.44	479.08	
Weaving mattress 280 linear feet—		
Brush 155 cords, at $2.15	333.25	
Strand, ⅜-inch, 850 pounds, at $3.75	31.88	
Subsistence	7.00	
Labor	224.65	
Ballasting mattress—stone, 105 cubic yards, at $1.47	154.35	
Subsistence	3.00	
Labor	26.31	
Total cost of Groin C	....	1,972.32
Groin No. 1, length beyond outer wall, 127 feet; length inside post circle, 67 feet—		
9 cockle burs, at $8.80	79.20	
7 gabion burs (30 feet), at $68.44	479.08	
8 gabion burs (20 feet), at $55.07	440.56	
Total cost of Groin No. 1	....	998.84
Groin No. 2, length 120 feet—		
8 gabion burs (30 feet), at $68.44	547.52	
8 gabion burs (20 feet), at $55.07	440.56	
Total cost Groin No. 2	....	988.08
Connecting groin, length 40 feet—		
10 cockle burs, at $8.80	88.00	
1 gabion burs (30 feet), at $68.44	68.44	
Total cost of connecting groin	....	156.44
Groin on Radial No. 6; length, 42 feet:		
25 fascines, at $4.81	120.25	
14 cords brush, at $2.15	30.10	
21 cubic yards rock, at $1.47	30.87	
Labor, placing brush and stone	21.63	
Total cost of groin on Radial No. 6	....	202.85
Total cost of groin construction	....	7,941.42
Constructing and sinking 103 linear feet abatis:		
Pile work—		
Piling, 240 linear feet, at $0.0792	19.08	
Coal, 8 bushels, at 11 cents	.88	
Labor	12.13	32.09
Framing—		
Lumber, 1,731 feet B. M., at $17 per M	29.43	
Brush, 12 cords, at $2.15	25.80	
Clips, washers, bolts	6.82	
Subsistence	4.00	
Labor	64.63	130.68
Ballasting and sinking stone, 15 cubic yards, at $1.47	22.05	
Labor	10.31	32.36
Total cost abatis construction	....	195.13
Constructing 1 row curtain above Groin C:		
Bracing—		
Lumber, native, 1,196 feet B. M., at $17	20.33	
Clips and nails	5.16	
Subsistence	2.00	
Labor	47.56	75.05
Pile work:		
Piling, 640 linear feet, at $0.0792	50.69	
Coal, 16 bushels, at 11 cents	1.76	
Labor	9.94	62.39
Screening brush, 7 cords, at $2.15	15.05	
Labor	8.63	23.68
Total cost construction 1 row curtain	....	161.12

Exhibit Q.—*Elements of work and cost in detail of remodeling, extending, etc., Bank 6 F, Howards Bend Reach, from September, 1898, to June, 1899*—Continued.

Classification and extent.	Cost in item.	To
Restoring and paving upper slope:		
Stone, 91 cubic yards, at $1.47	$133.77	
Labor	104.25	
Total cost of restoring and paving upper slope		
Removing 624 cubic yards of earth from bankhead, labor	66.50	
Total cost of remodeling, extending, etc., April to June, 1899		8,
Grand total		11,

Exhibit R.

Element of work and cost in detail of 6,450 linear feet of revetment in Pelican Bend d the fiscal year ending June 30, 1899.

Classification and extent.	Cost in item.	To
Procuring 3,384.5 cords brush, at $1.5287 + per cord loaded on barges	$5,173.90	
Towage to point of expenditure	615.29	
Total cost delivered on work, at $1.7105 + per cord		$5,7
Procuring 13,546.64 cubic yards stone ballast by contract:		
5,566.36 cubic yards loaded on barges at quarry landing	3,843.56	
Towage to point of expenditure	628.30	
7,980.28 cubic yards loaded on cars near work	5,710.17	
Labor and subsistence, hauling to point of expenditure	2,474.03	
Total cost delivered on work, at $0.93426 per cubic yard		12,
Grading bank, 6,450 linear feet, containing 24,334 cubic yards of earth:		
Supplies	101.50	
Subsistence	118.29	
Labor	406.56	
Total cost, at $0.02574 per cubic yard		
Construction and anchorage of mattress, 6,825 linear feet, or 629,924 square feet:		
½-inch strand, 51,390 pounds	1,820.58	
1,540 linear feet pine piling (deadmen)	327.95	
4,043 cable clips	280.41	
Subsistence	1,288.40	
Labor, weaving	3,355.55	
Total cost, at $0.01123 per square foot		7,
Ballasting mattress and bank, 13,616.66 cubic yards:		
Subsistence	620.50	
Labor	2,669.76	
Total cost of ballasting, at $0.24164 per cubic yard		3,
Preparatory outfitting of plant	95.76	
Grand total cost 6,450 linear feet of revetment, at $4.5784 per linear foot		29,

APPENDIX H.

ANNUAL REPORT ON THE OSAGE RIVER, BY MR. F. B. MALTBY, ASSISTANT ENGI

Missouri River Commission,
Osage City, Mo., June 23, 1

Captain: I have the honor to submit the following report of operations o Osage River for the fiscal year ending June 30, 1899:

The work for several years past has been almost exclusively confined to the struction of Lock and Dam No. 1. Owing to a lack of appropriations, no work has been done since closing down in November, 1897, at which time the walls were about 75 per cent completed. For the details of this work refere had to the Report of the Chief of Engineers for 1898. At the beginning of the the only force employed was a watchman caring for the plant at the lock and m employed in the St. Louis office in drawing details for the dam. On July 24, 1

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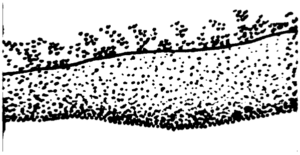

PLATE II

URI RIVER COMMISSION
WORKS BELOW KANSAS CITY, MO.
PROGRESS MAP
OF
SSOURI RIVER
ABOVE
ASGOW, MO.
FROM
e Missouri Bend to Foot of
Wilhoites Bend
SHOWING
and Character of Works in
f Construction and Completed

SCALE
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: MEAN STAGE OF RIVER 3.4 FT. ABOVE S. L. W.

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UCTED DURING CURRENT FISCAL YEAR THUS
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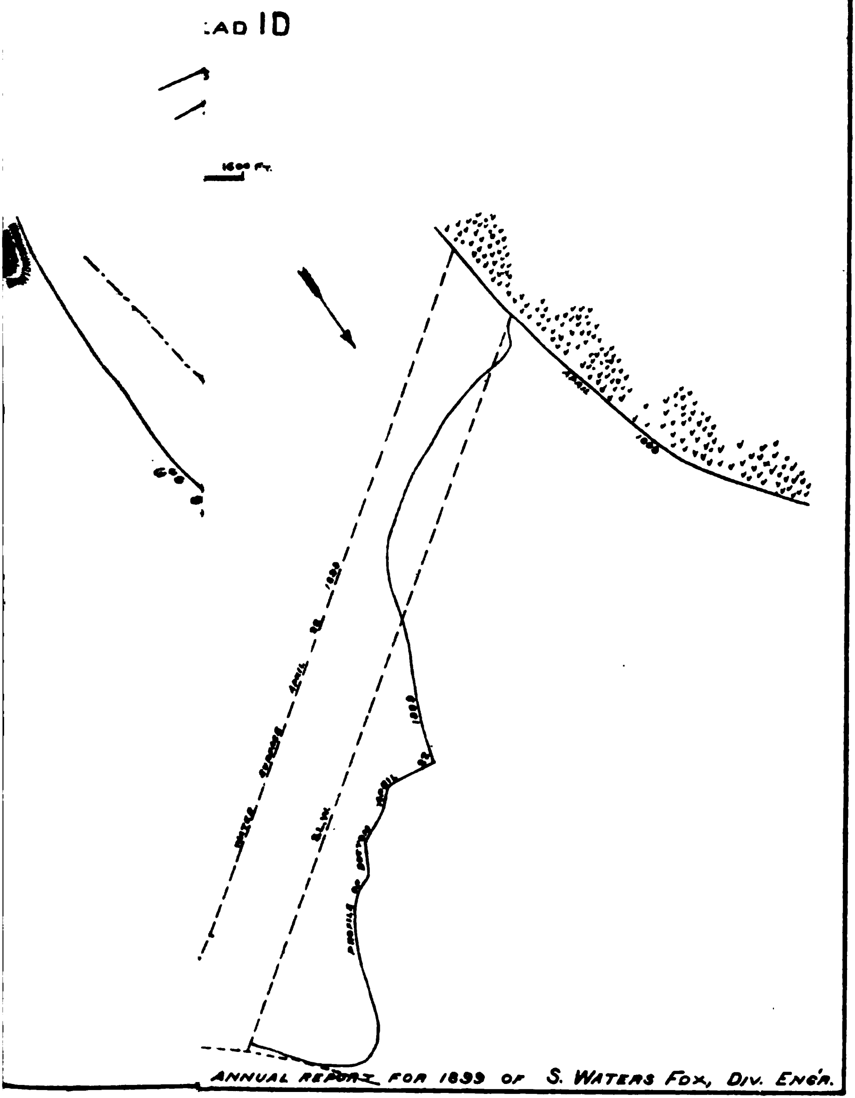
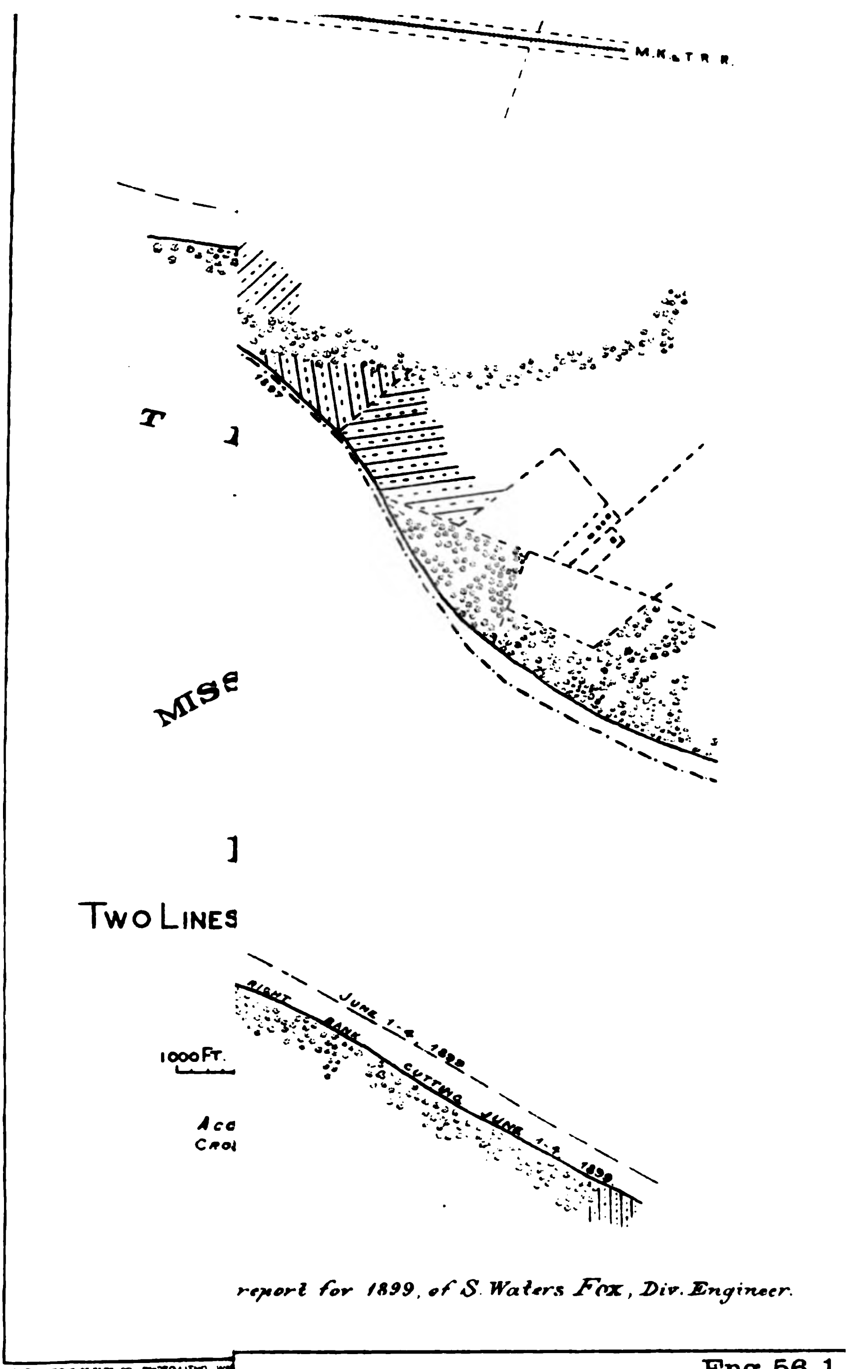
ny annual report for 1899 of
rs Fox, Division Engineer.

PLATE III



ANNUAL REPORT FOR 1899 OF S. WATERS FOX, DIV. ENG'R.

THE NORRIS PETERS CO. PHOTO-LI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report for 1899, of S. Waters Fox, Div. Engineer.

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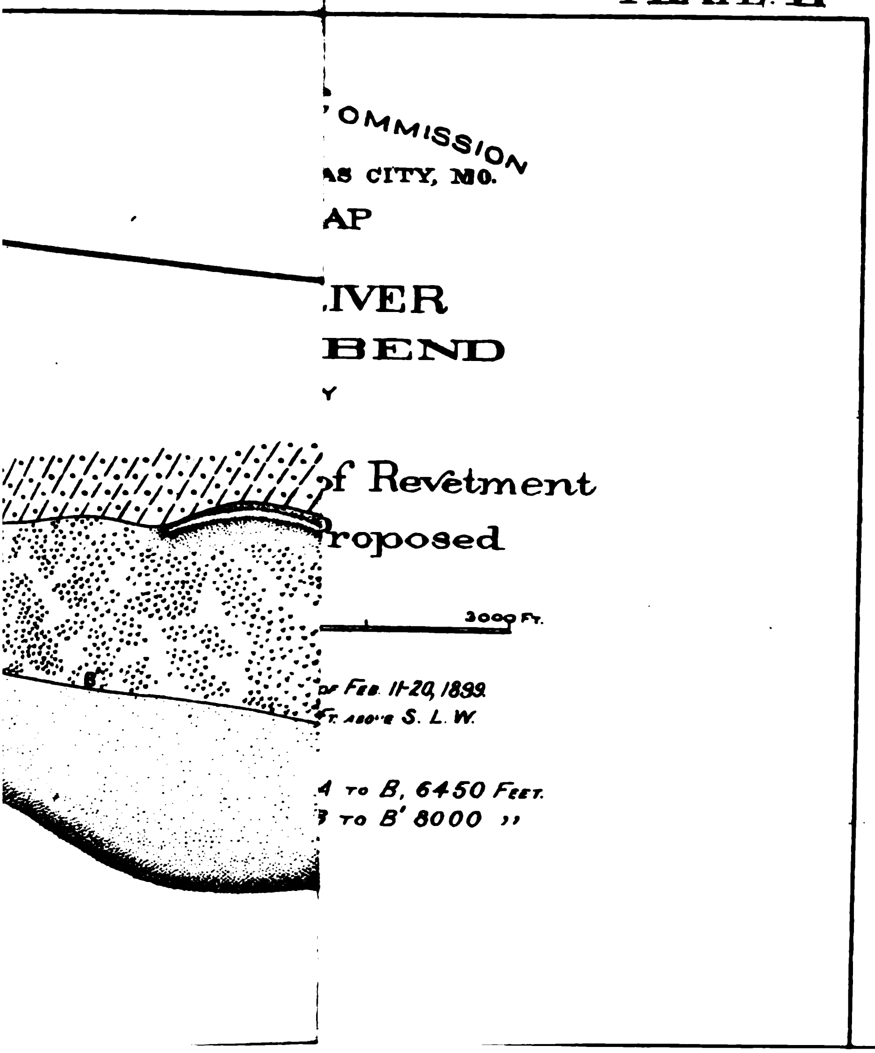
PLATE. VI



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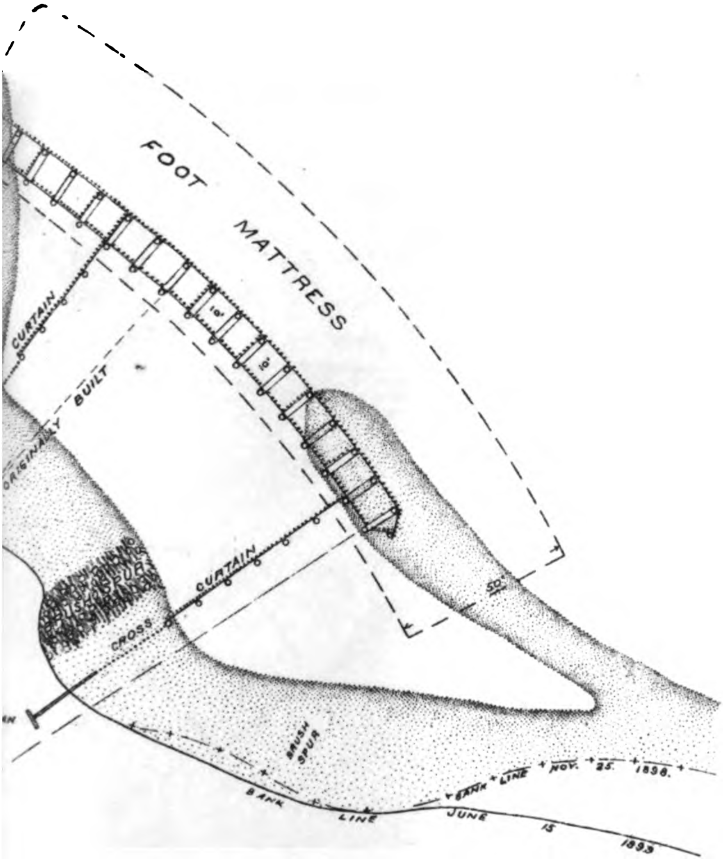

TO ACCOMPANY ANNUAL REPORT FOR 1899 OF S. WATERS FOX, DIV. ENG

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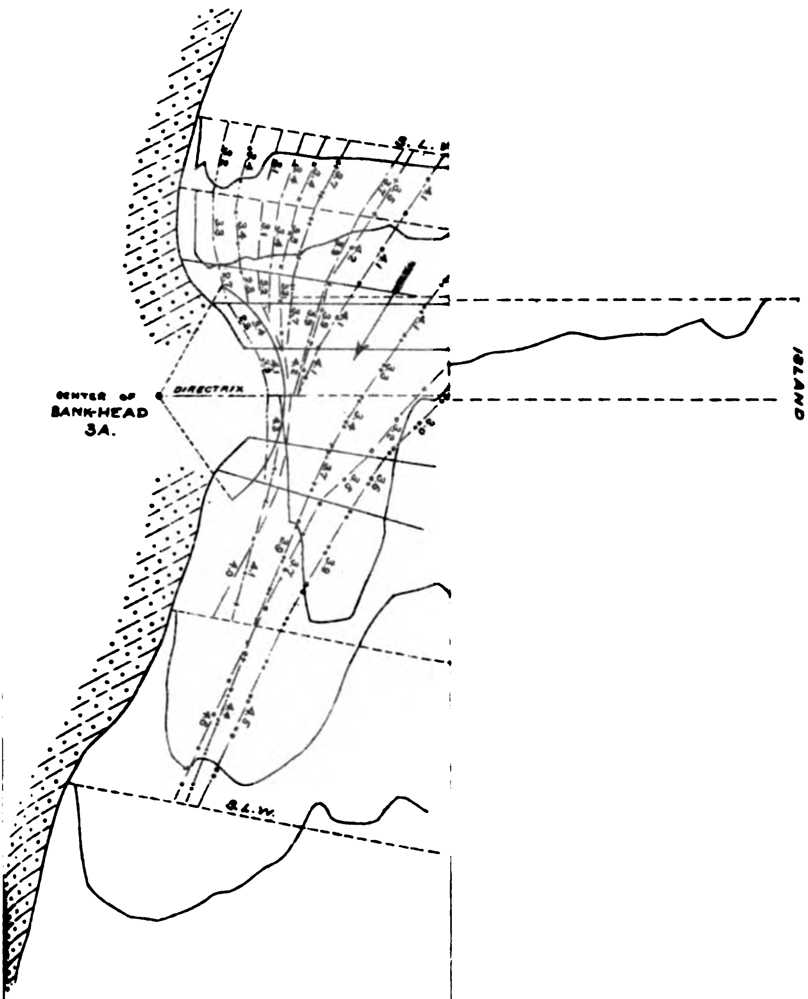
PLATE VIII



OF S. WATERS FOX. DIV. ENG'R.

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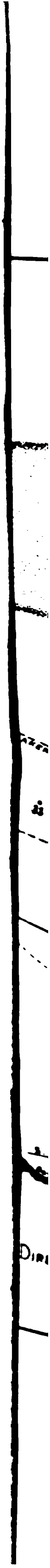
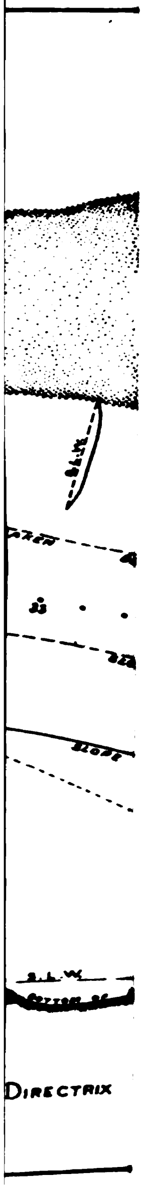
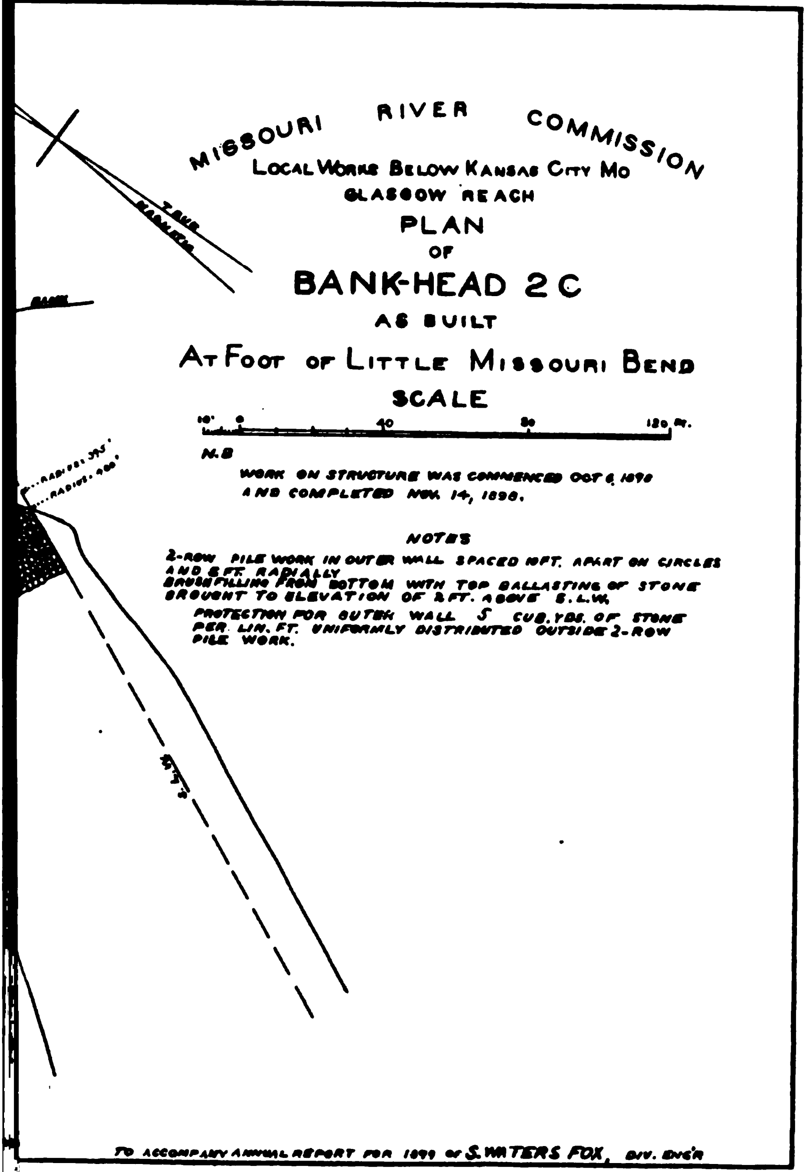




H.W.M.
SLOPE
S.L.W.
DIRECTRIX

PLATE X



MISSOURI RIVER COMMISSION
LOCAL WORKS BELOW KANSAS CITY MO
GLASGOW REACH

PLAN
OF
BANK-HEAD 2 C
AS BUILT
AT FOOT OF LITTLE MISSOURI BEND

SCALE

N.B

WORK ON STRUCTURE WAS COMMENCED OCT 6, 1898
AND COMPLETED NOV. 14, 1898.

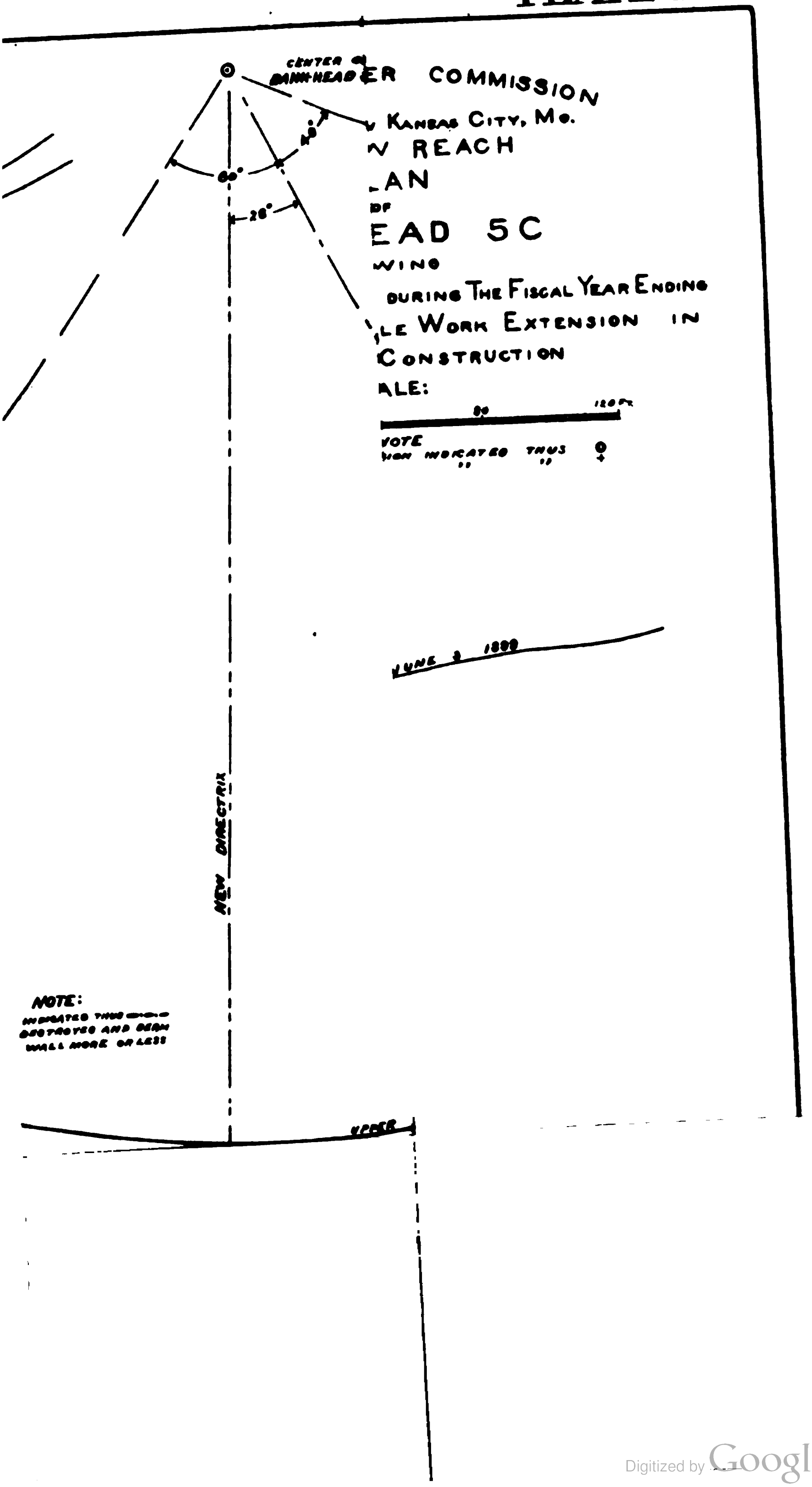
NOTES

2-ROW PILE WORK IN OUTER WALL SPACED 10 FT. APART ON CIRCLES AND 5 FT. RADIALLY
BRUSHFILLING FROM BOTTOM WITH TOP BALLASTING OF STONE BROUGHT TO ELEVATION OF 2 FT. ABOVE S.L.W.

PROTECTION FOR OUTER WALL 5 CUB. YDS. OF STONE PER LIN. FT. UNIFORMLY DISTRIBUTED OUTSIDE 2-ROW PILE WORK.

TO ACCOMPANY ANNUAL REPORT FOR 1899 OF S. WATERS FOX, DIV. ENG'R

PLATE XI


CENTER OF BANK-HEAD
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ION INDICATED THUS
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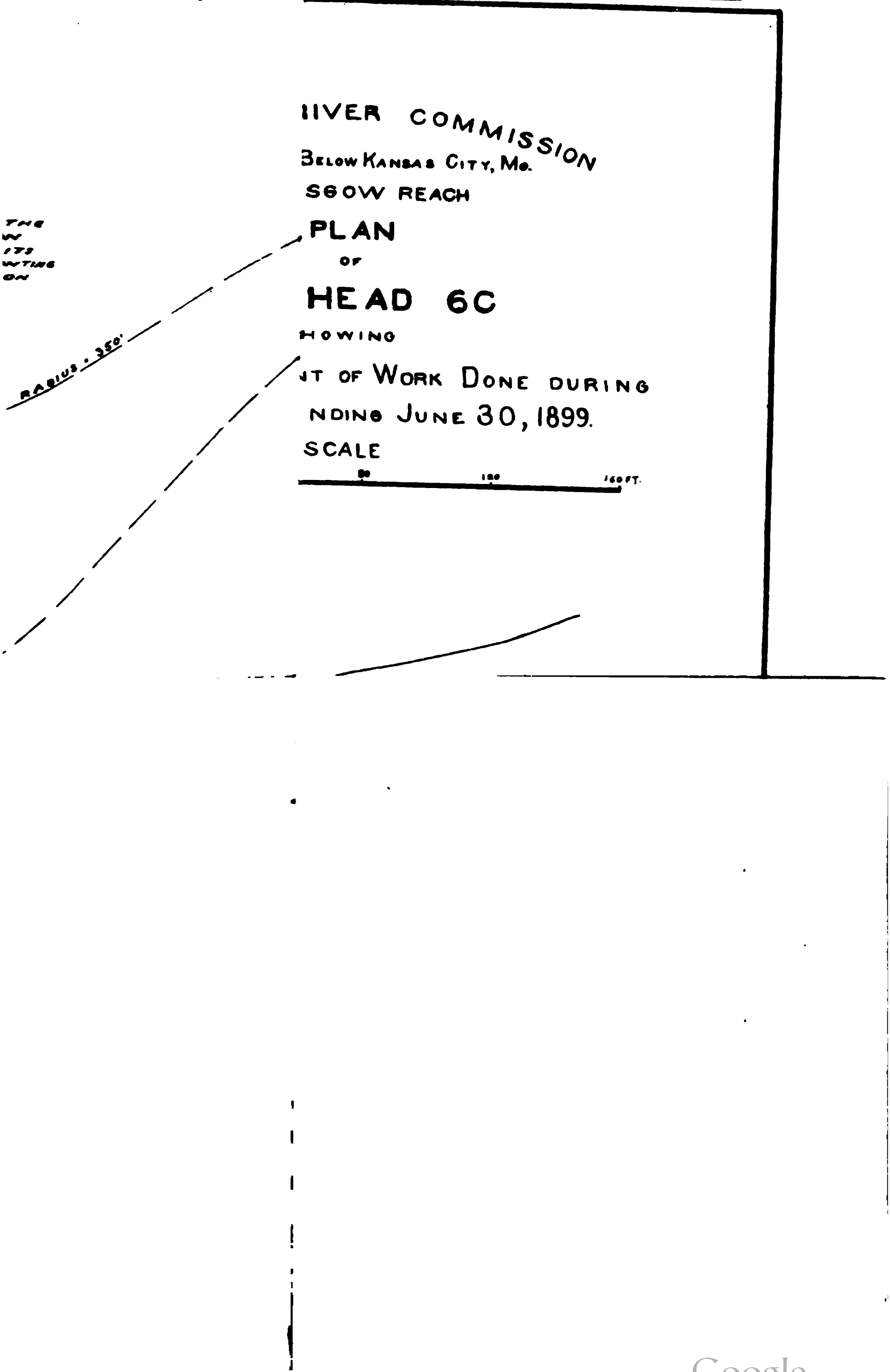
PLATE XII


IIVER COMMISSION
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SGOW REACH
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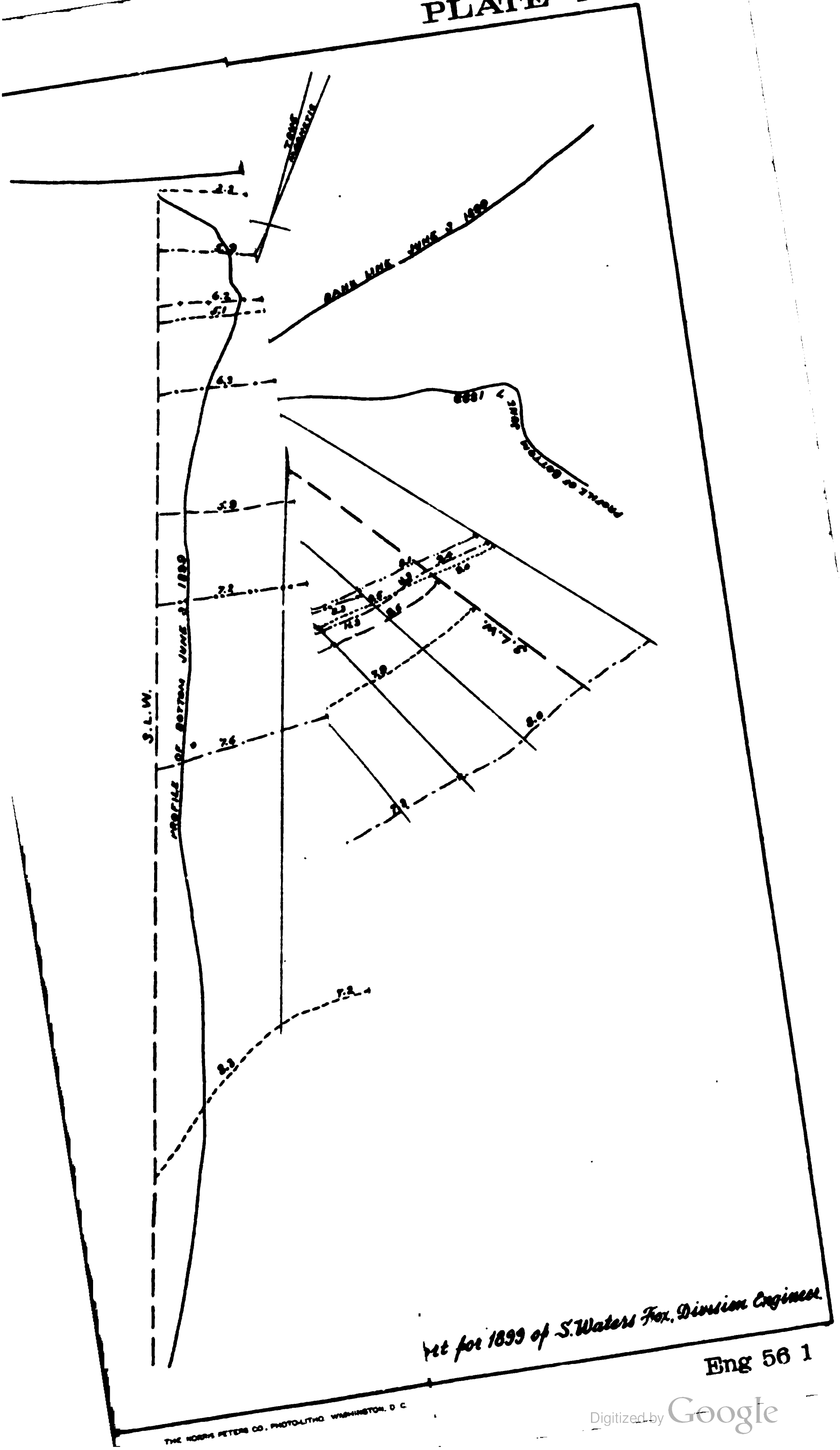
PLATE XIII

13



rt for 1899 of S. Waters Fox, Division Engineer

Eng 56 1

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

14

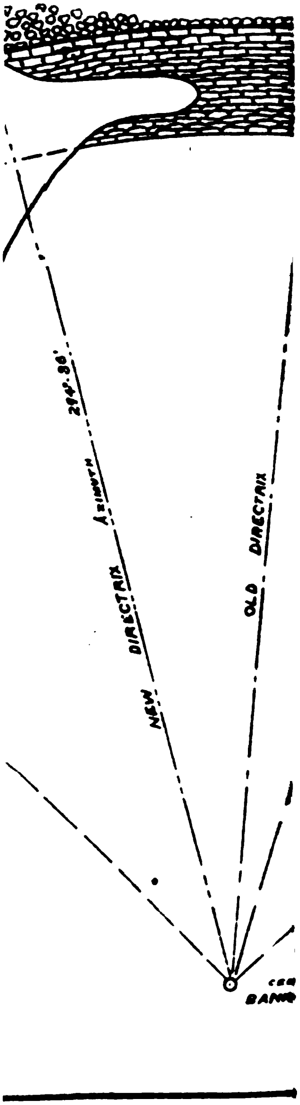
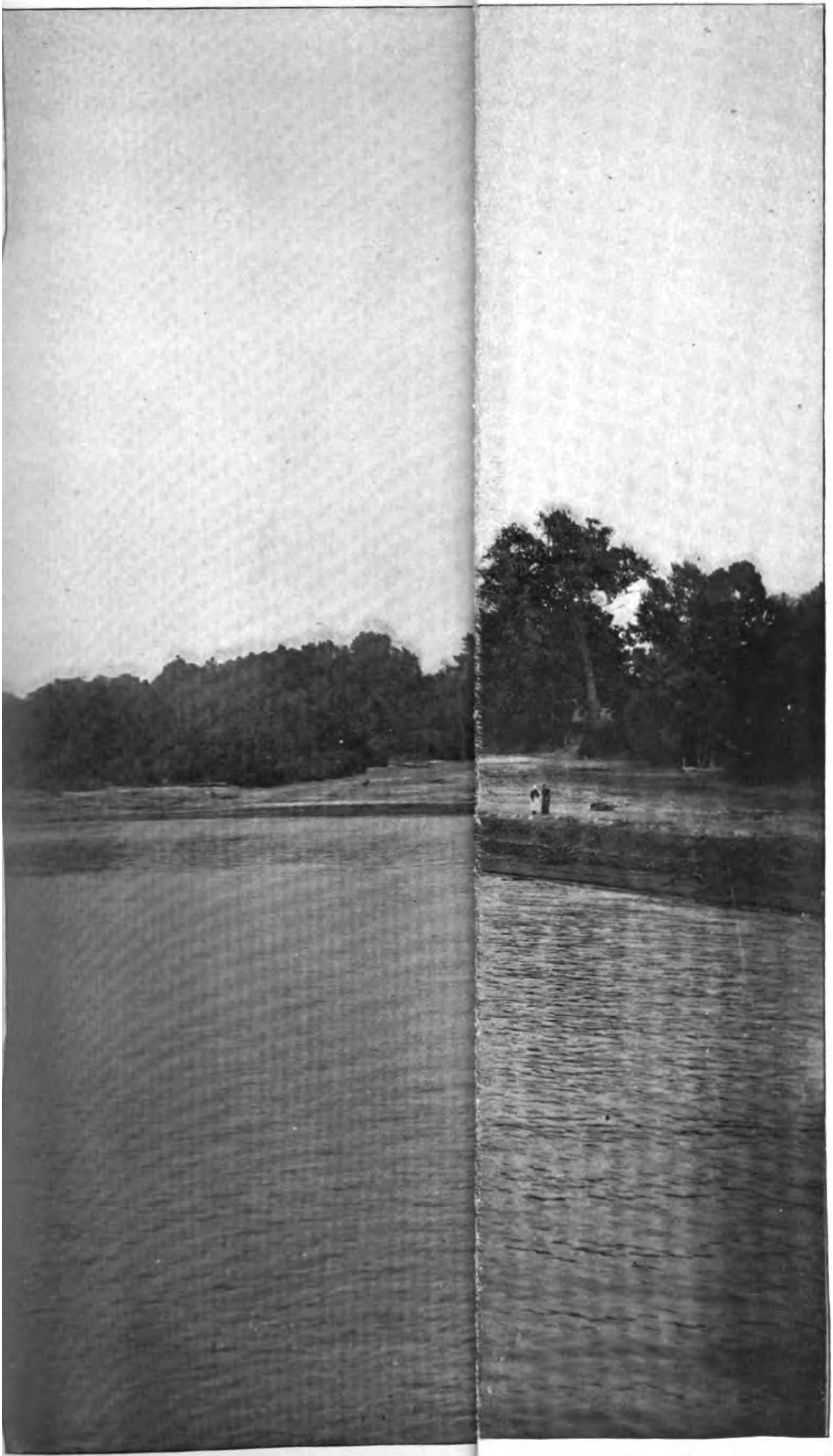
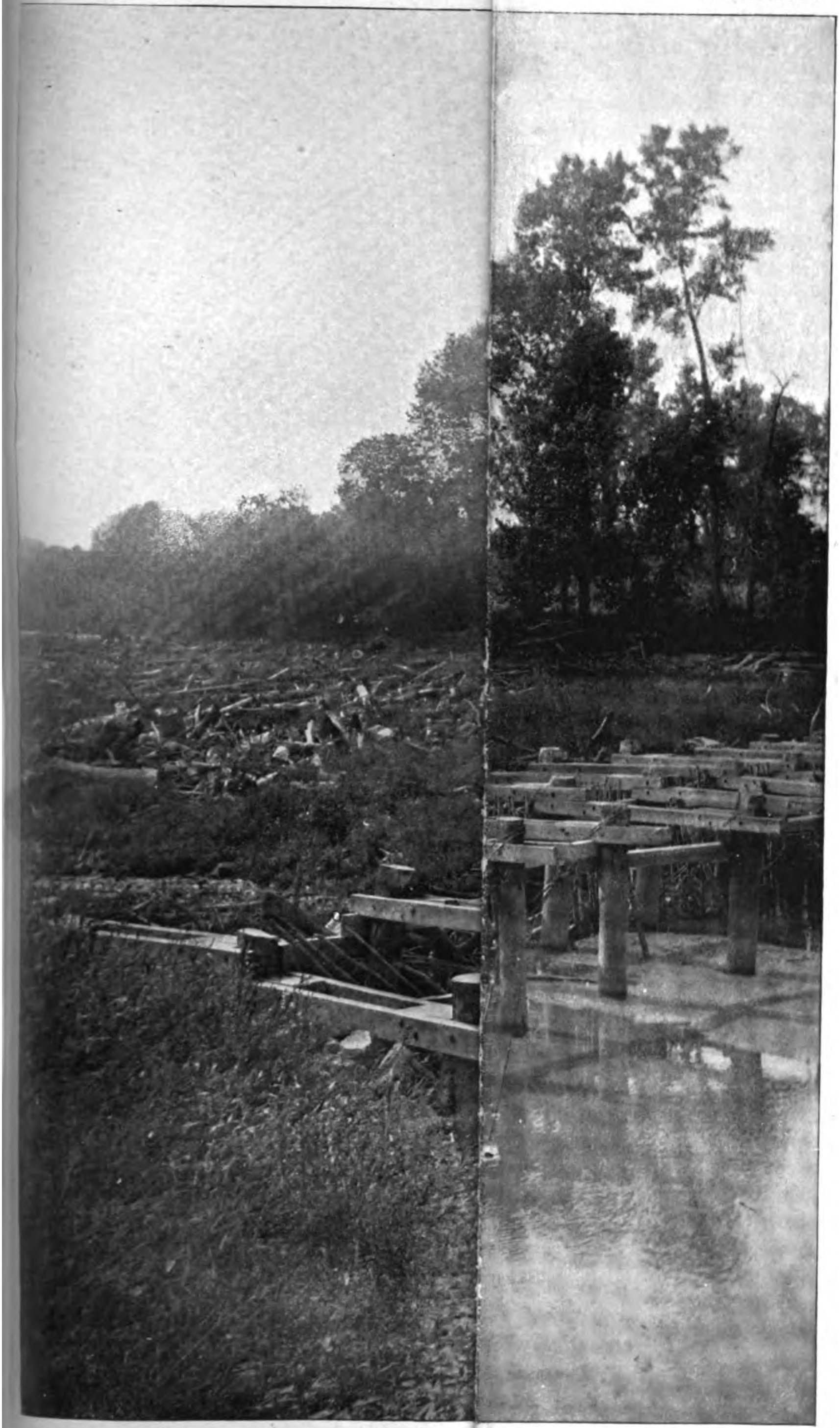


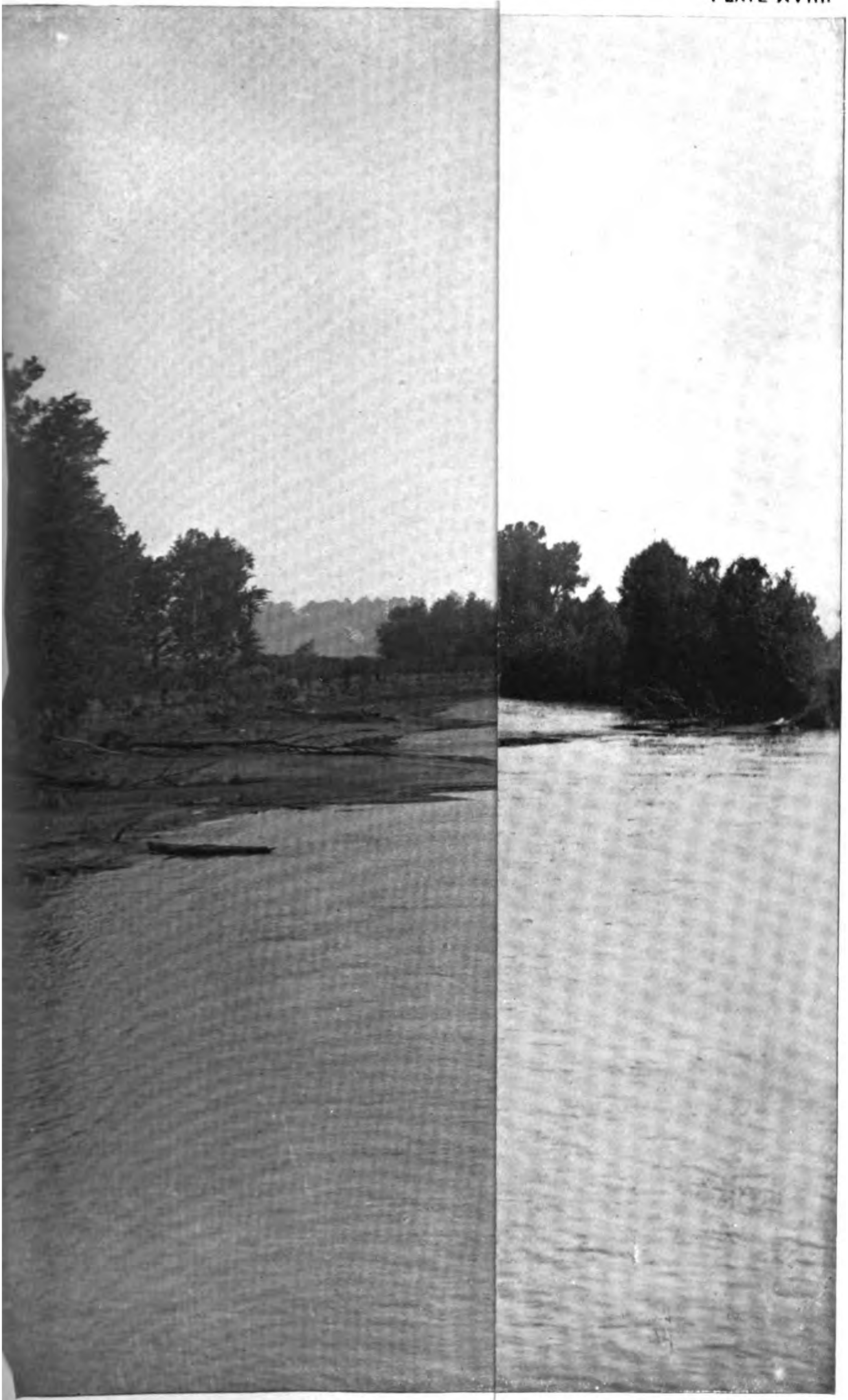
PLATE XVI.



INDEPENDENCE CHUTE. LOOKING DOWNSTR A. STAGE ABOUT 2.5 FEET ABOVE
S. L. W. THE DEPTH OF WATER IN THIS C MAIN STEAMBOAT CHANNEL OF
THE RIVER. DIKE 1 A WAS BUILT IN OCTO

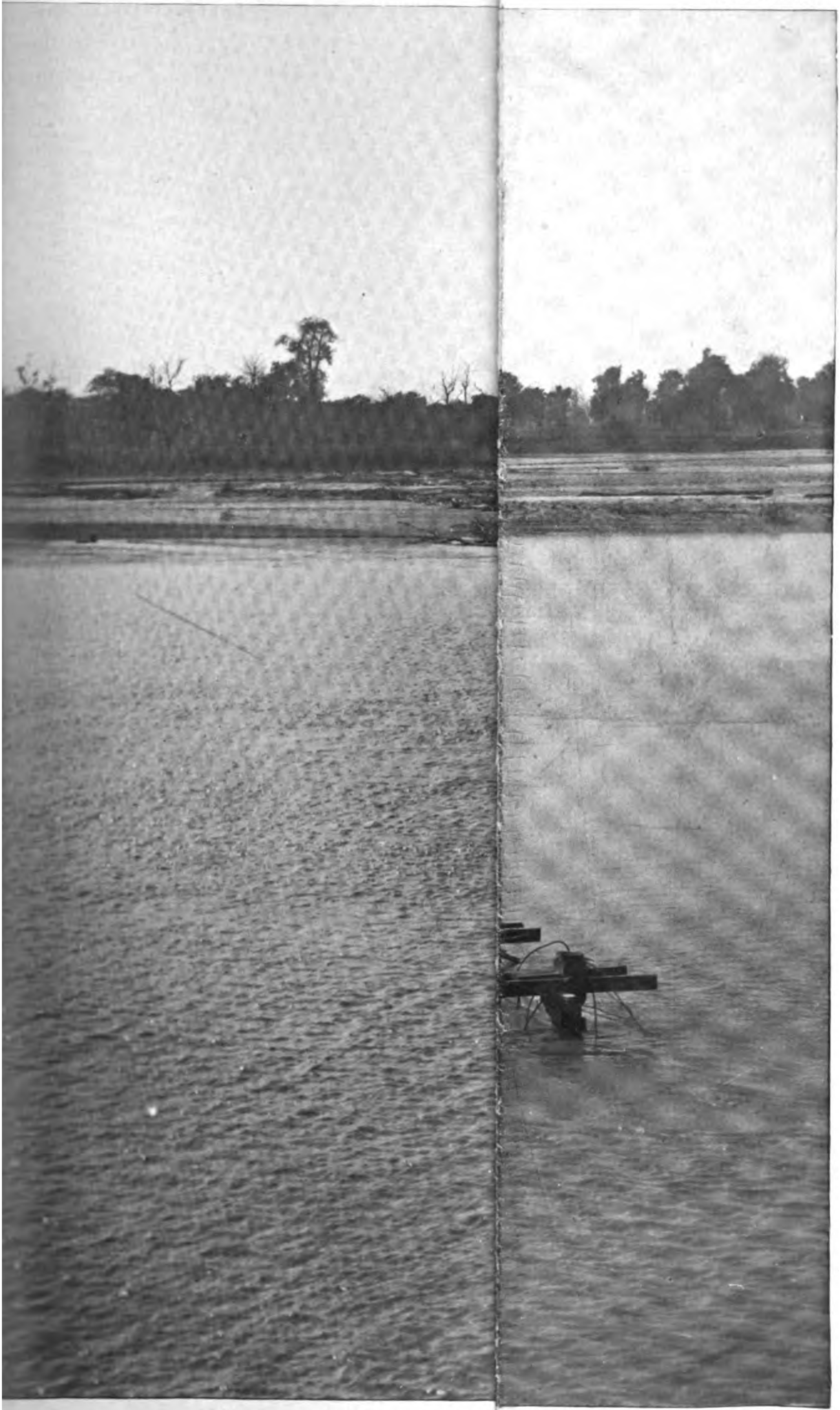


DIKE 1 A, INDEPENDENCE CHUTE. LOOKING UFBUILT OF COTTONWOOD LUMBER
AND PILES SPACING 10 FUST 28, 1898.



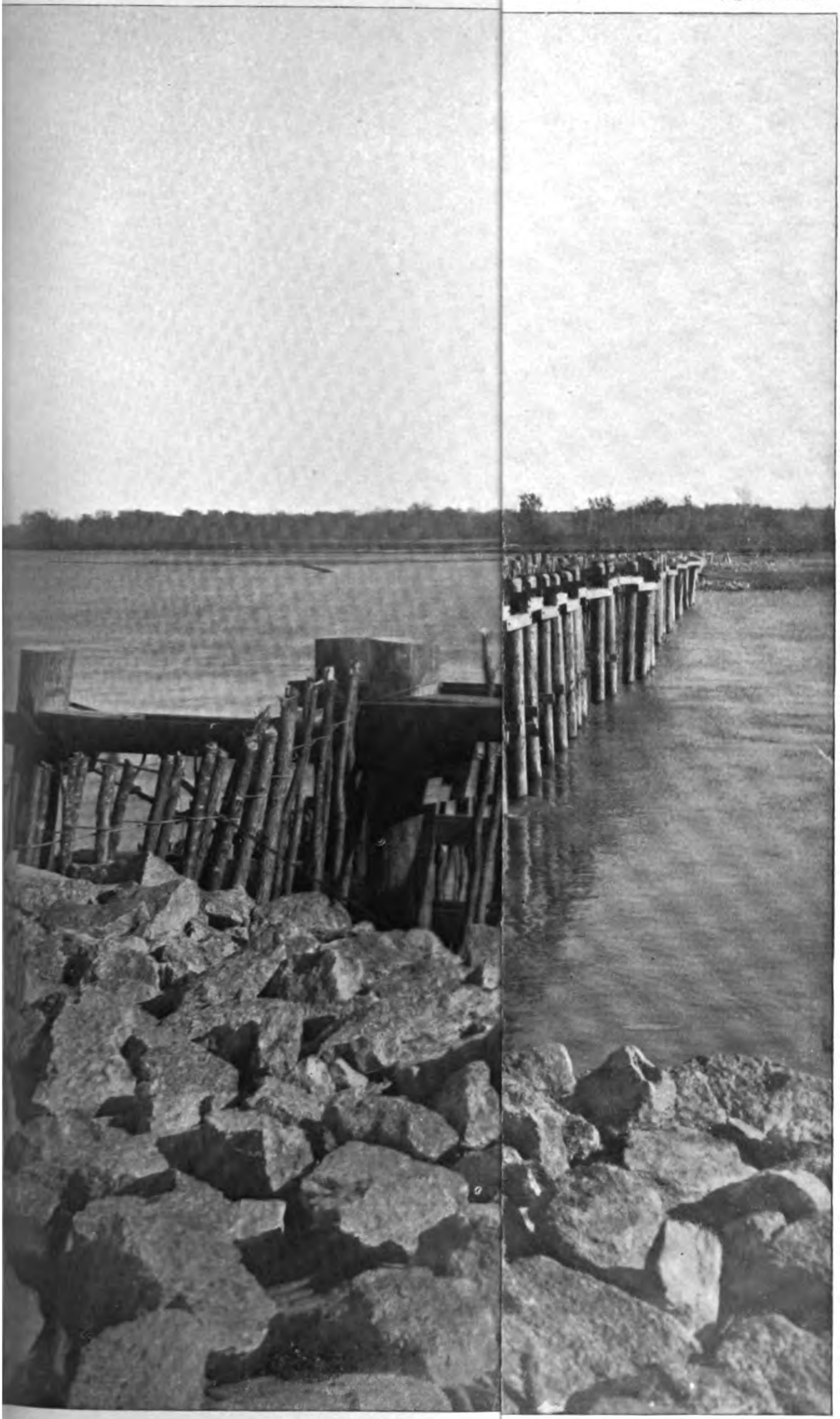
INDEPENDENCE CHUTE. FROM POINT BELOW FOCOUS FALL HAD A DEPTH OF 15 TO

PLATE XIX.

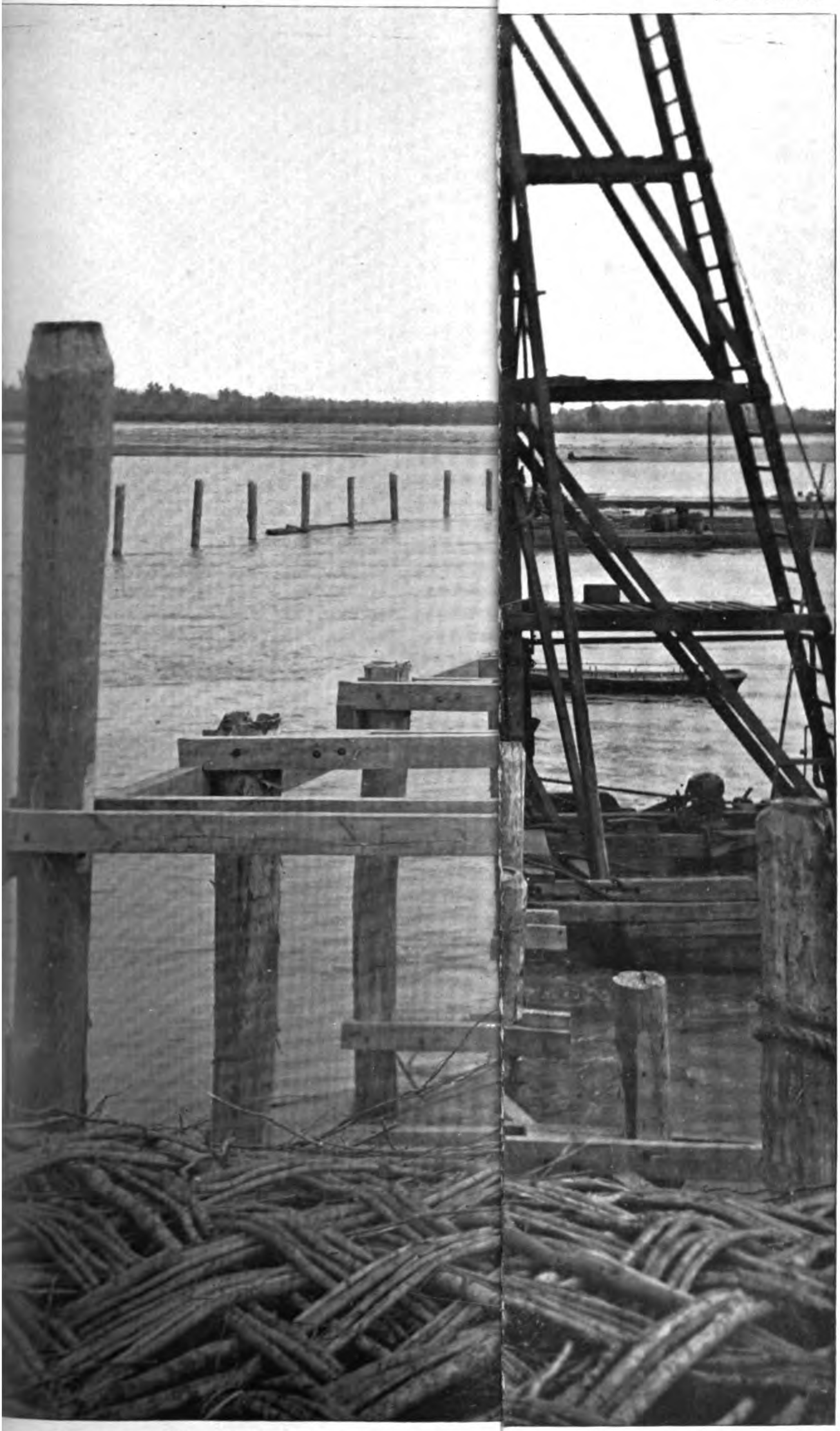


DIKE 1 B. VIEW FROM ROOF OF SNAG BOAT, JUST ED YELLOW-PINE LUMBER USED
IN OUTER HALF; REMAINDER COTTO N AUGUST 28, 1898.

PLATE XX.

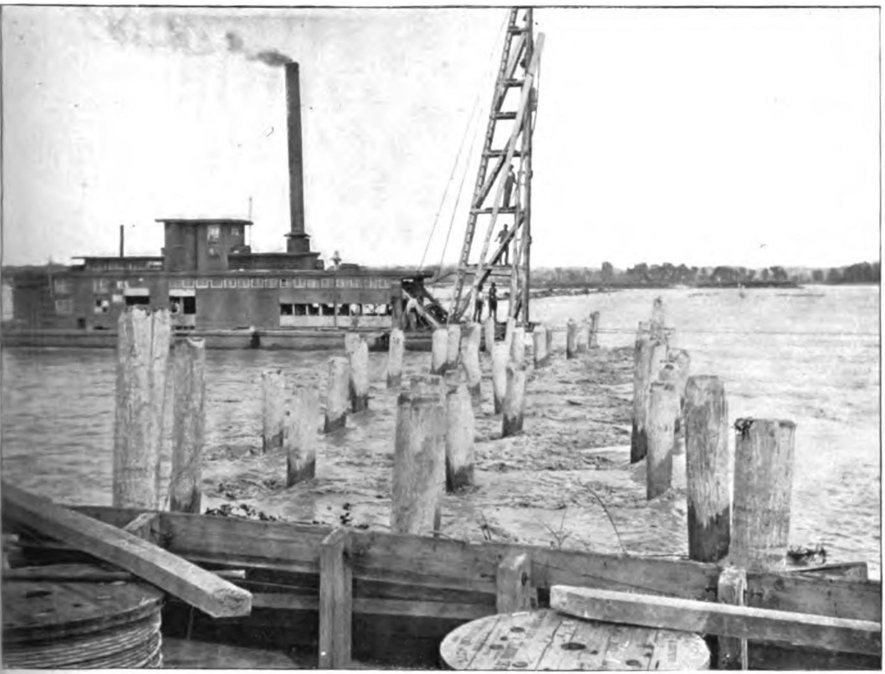


DIKE 2 A. FROM POINT ON LEFT BANK ABOVE SHORE HERE TO STREAM END, AND WAS
COMPLE



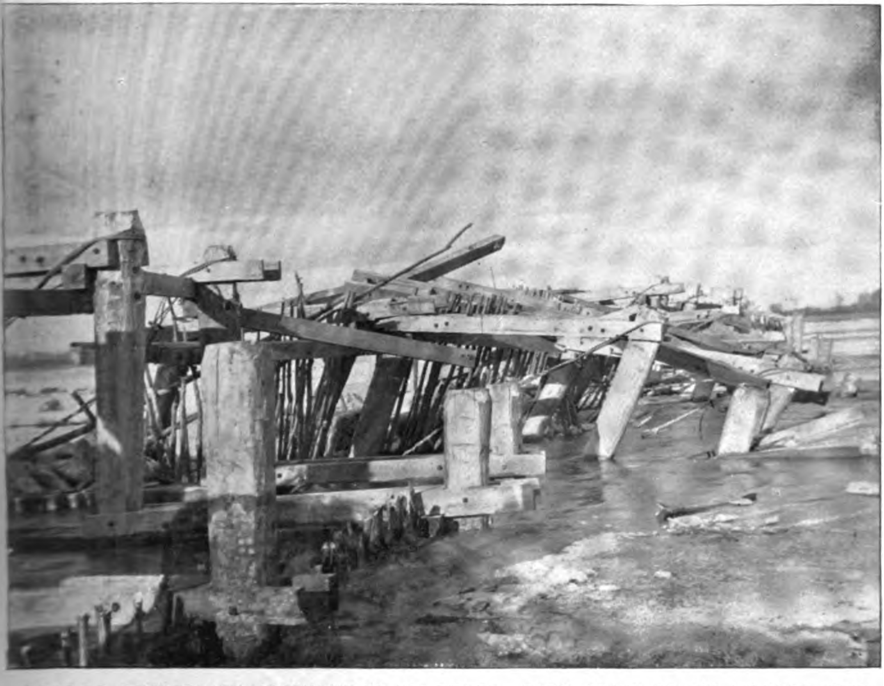
DIKE 3 C, IN PROCESS OF CONSTRUCTION. FROM RIG REE-ROW WORK FROM THERE TO
STR

MISSOURI RIVER COMMISSION, LITTLE BLUE REACH. PLATE XXIII.



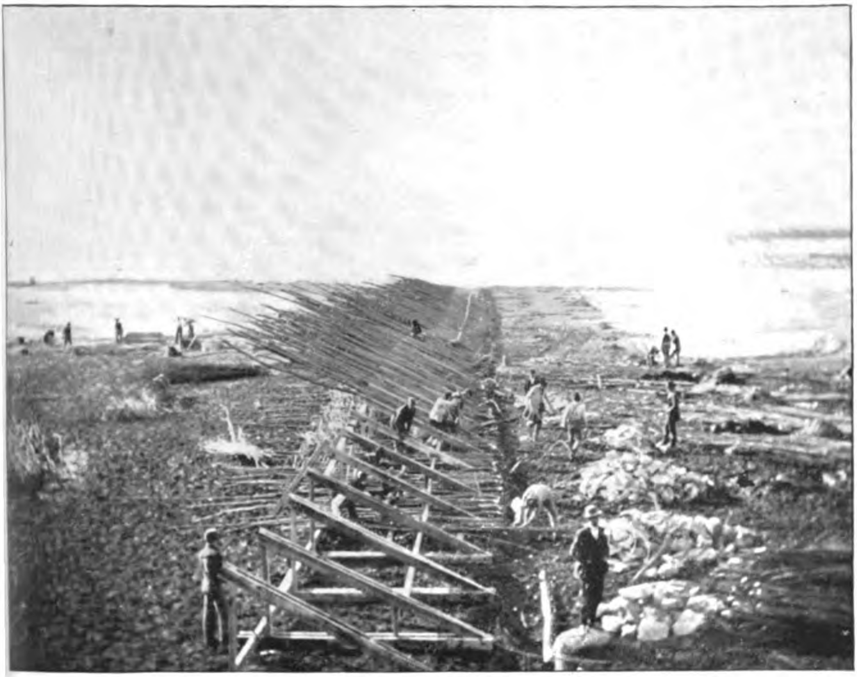
PILE DRIVER AT WORK RESTORING DIKE 2 A. STAGE 12 FEET ABOVE S. L. W. VIEW TAKEN JUNE 5, 1899.

MISSOURI RIVER COMMISSION, GLASGOW REACH. PLATE XXII.



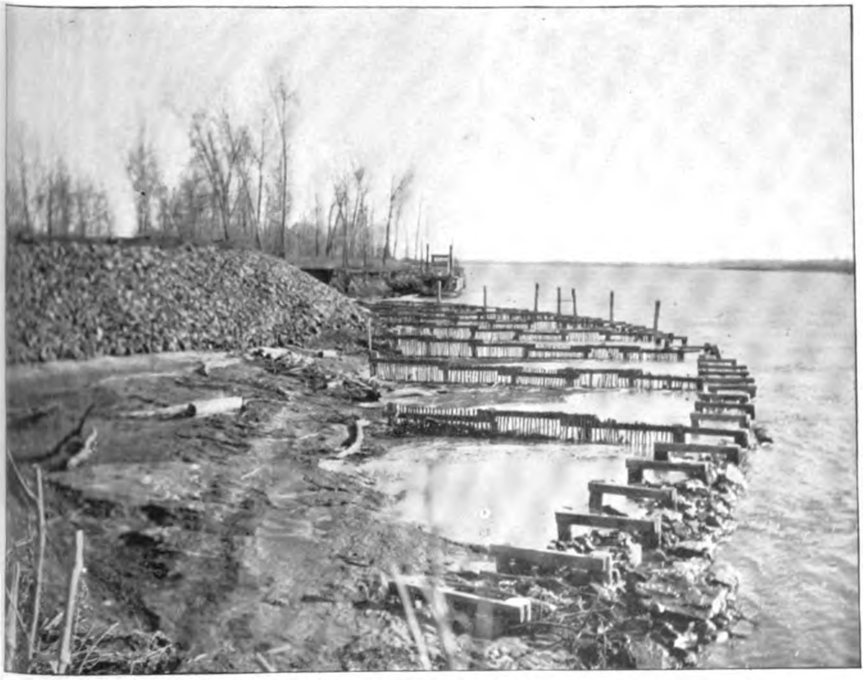
DIKE 3 C, DAMAGED BY MOVEMENT OF ICE GORGE. FROM POINT BELOW, 100 FEET FROM SHORE. STAGE 4.7 FEET ABOVE S. L. W. VIEW TAKEN DECEMBER 23, 1898.

MISSOURI RIVER COMMISSION, HUNTSDALE REACH. PLATE XXIV.

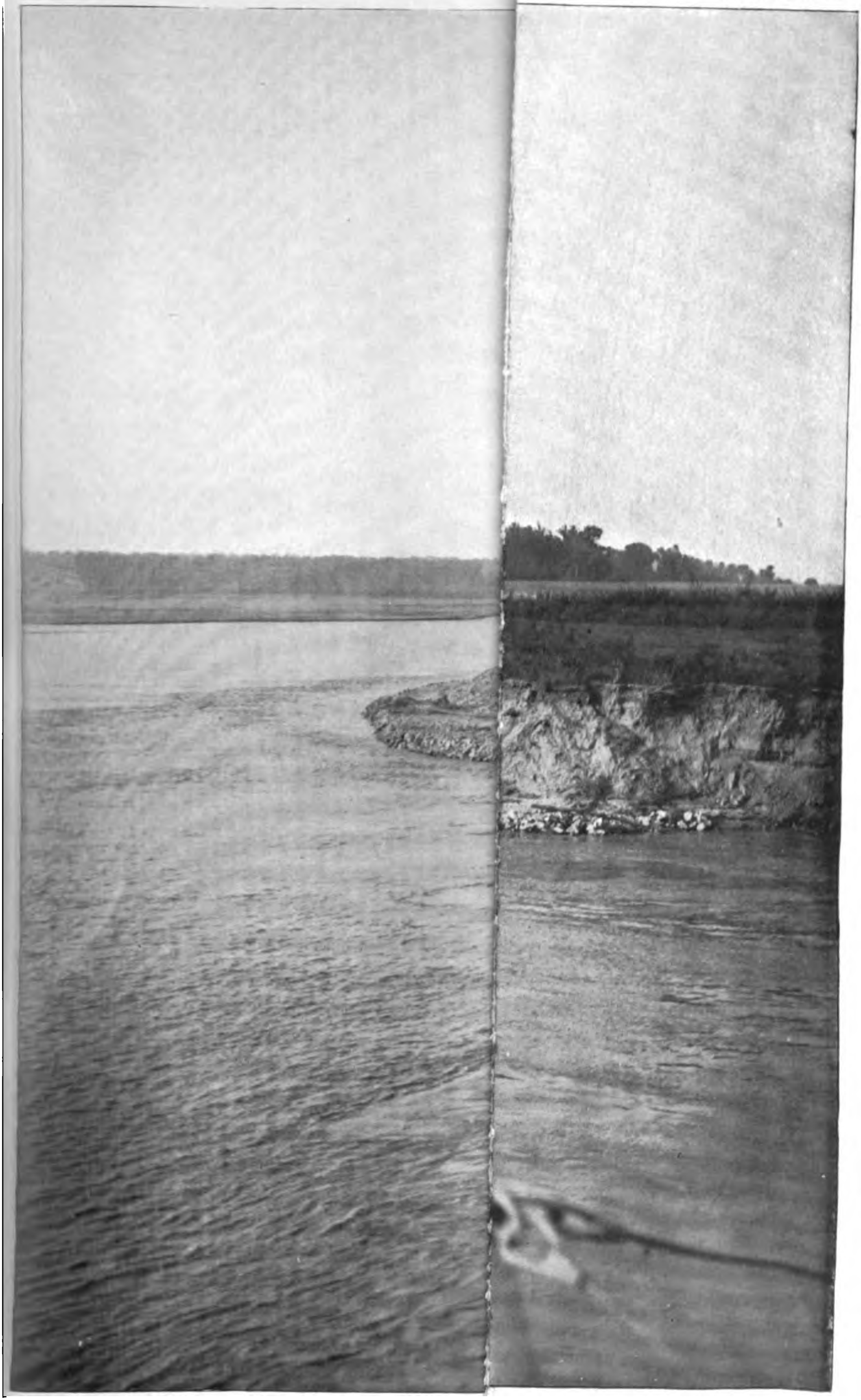


ABATTIS B. FROM LEFT BANK, LOOKING TOWARD RIVER. STAGE 1.4 FEET ABOVE S. L. W. VIEW TAKEN DECEMBER 29, 1898.

MISSOURI RIVER COMMISSION, GLASGOW REACH. PLATE XXV.

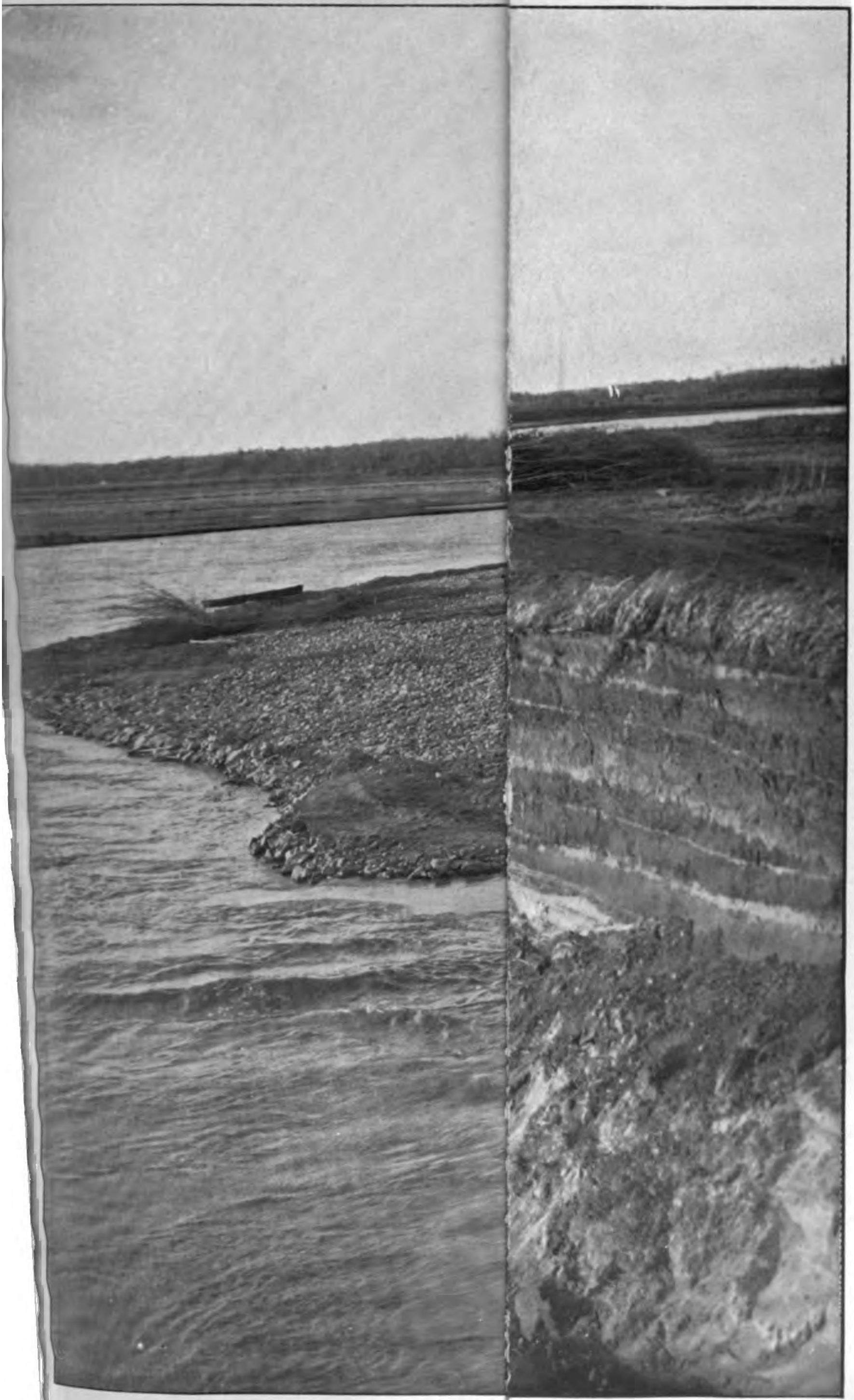


BANK HEAD 2 C. VIEW FROM SHORE JUST ABOVE STRUCTURE LOOKING DOWNSTREAM. BANK HEAD WAS COMPLETED NOVEMBER 14, 1898. STAGE 1.4 FEET ABOVE S. L. W.



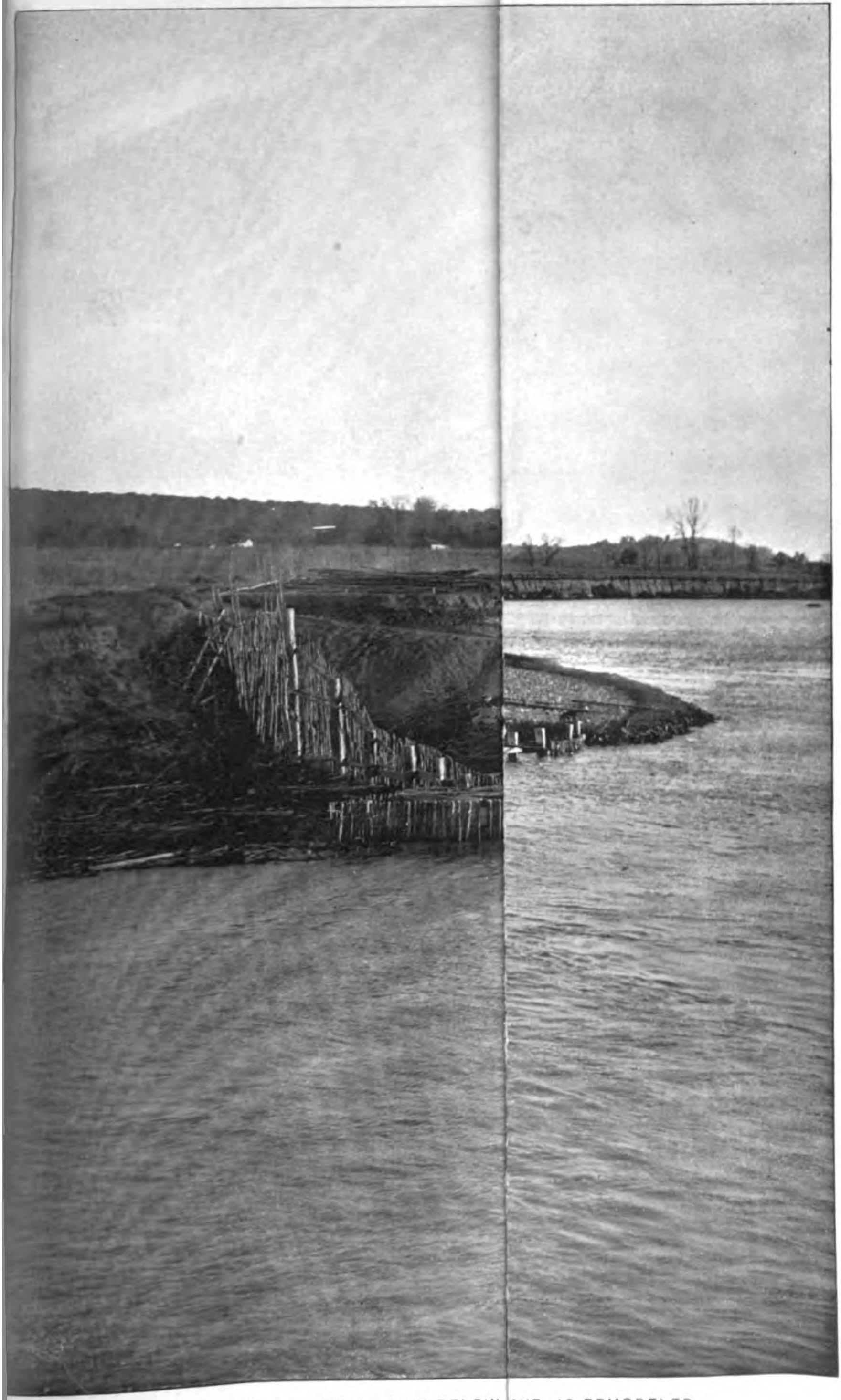
BANK HEAD 3 A. FROM ROOF OF SNAG BOAT C. BANK HEAD WAS BUILT IN 1897.

PLATE XXVII.



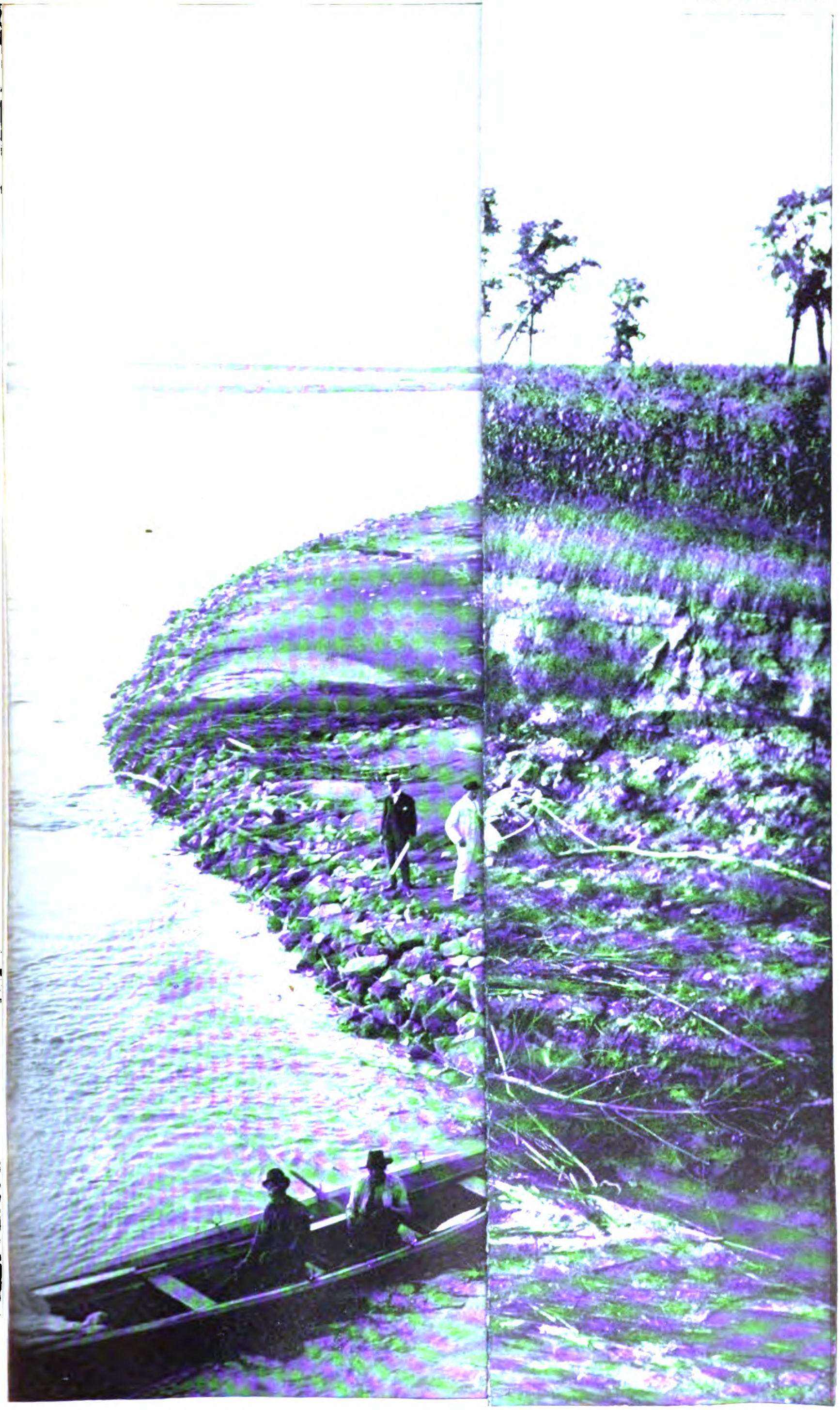
BANK HEAD 3 A, AS 1898.

PLATE XXVIII.



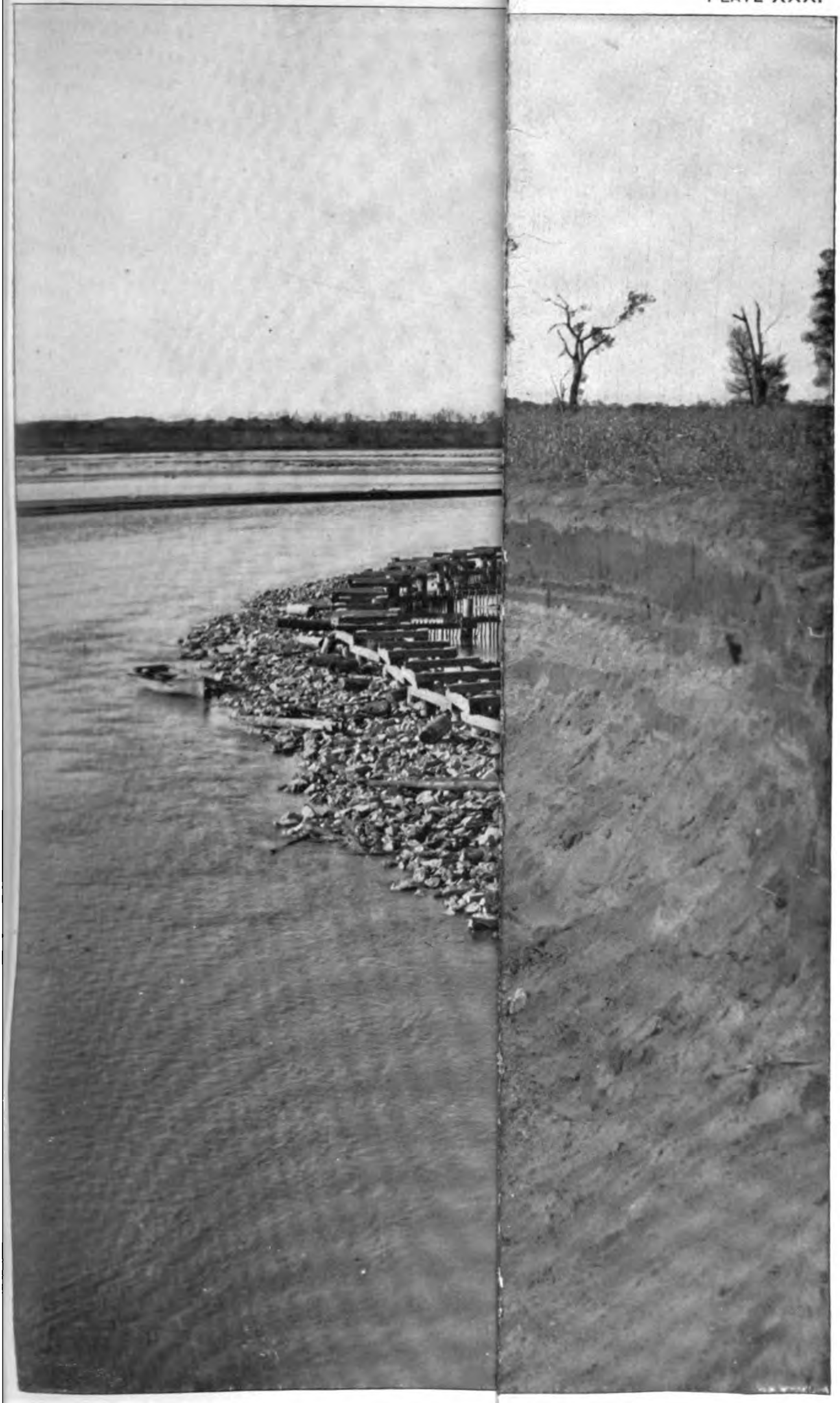
BANK HEAD 3 A. FROM POINT BELOW OVE, AS REMODELED.

PLATE XXIX.



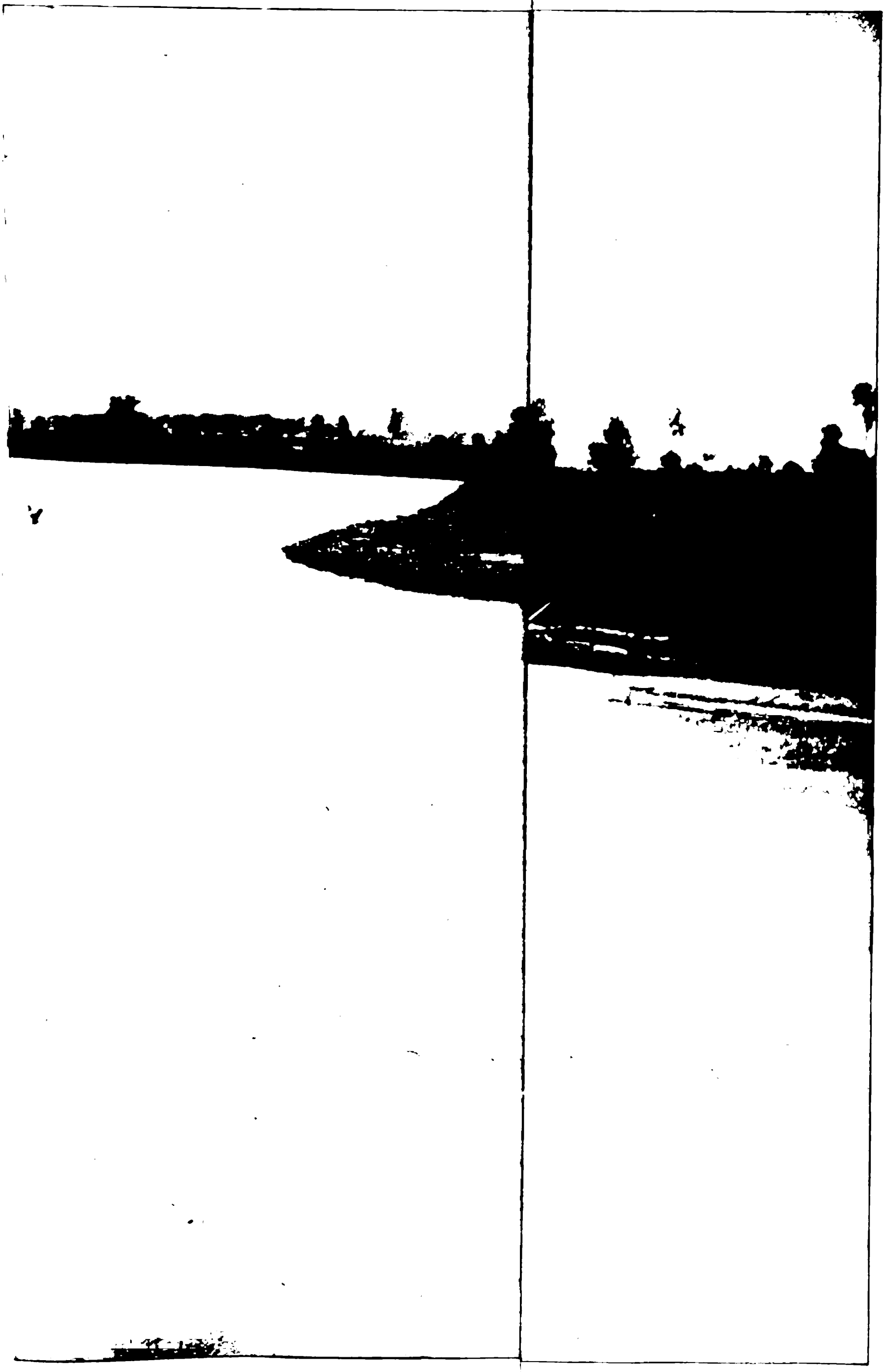
BANK HE

PLATE XXX.



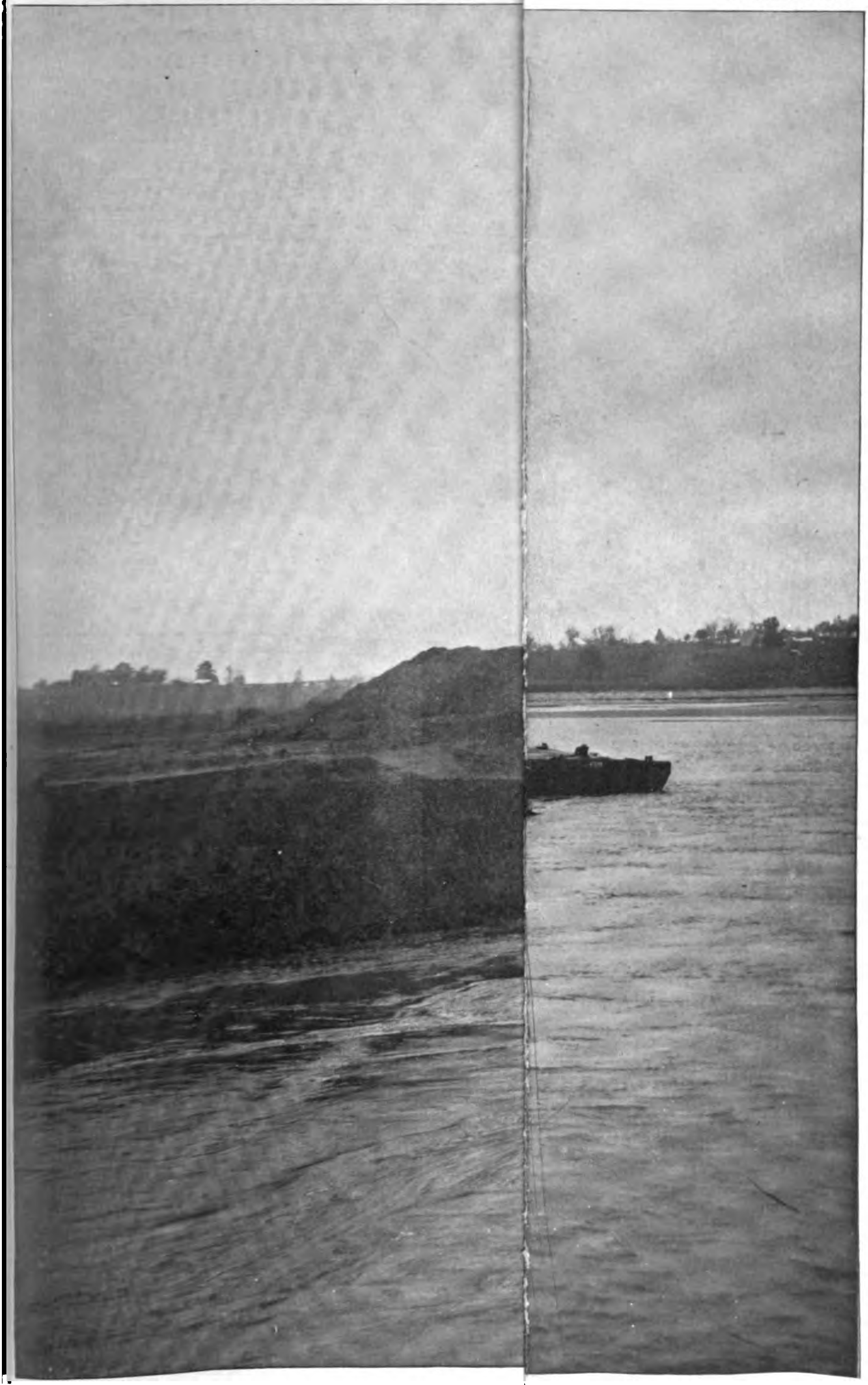
BANK HEAD 1 B. AFTER REMODELING AND TAKEN NOVEMBER 6, 1898.

PLATE XXXI.

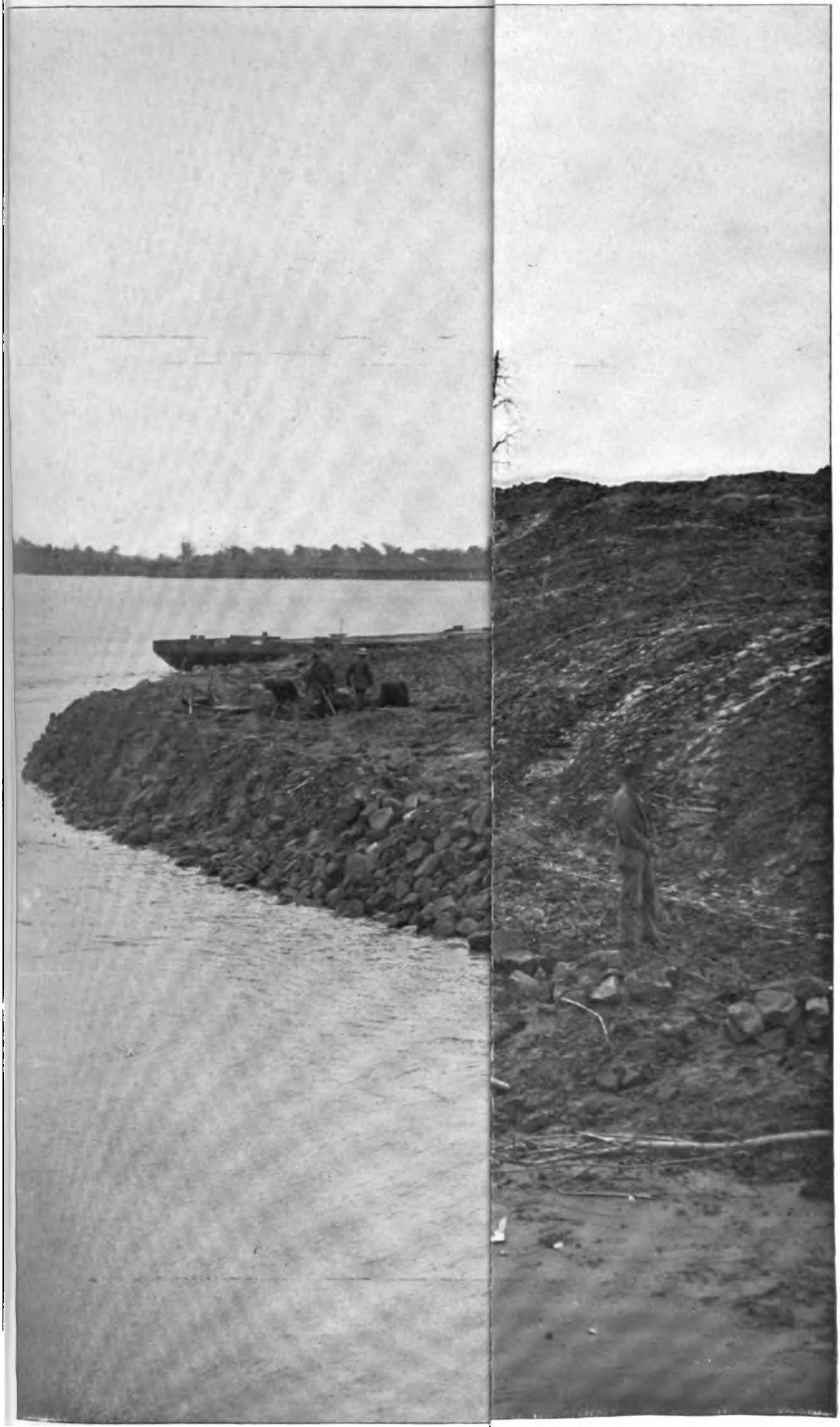


BANK HEAD 6C. LOOKI 29, 1898.

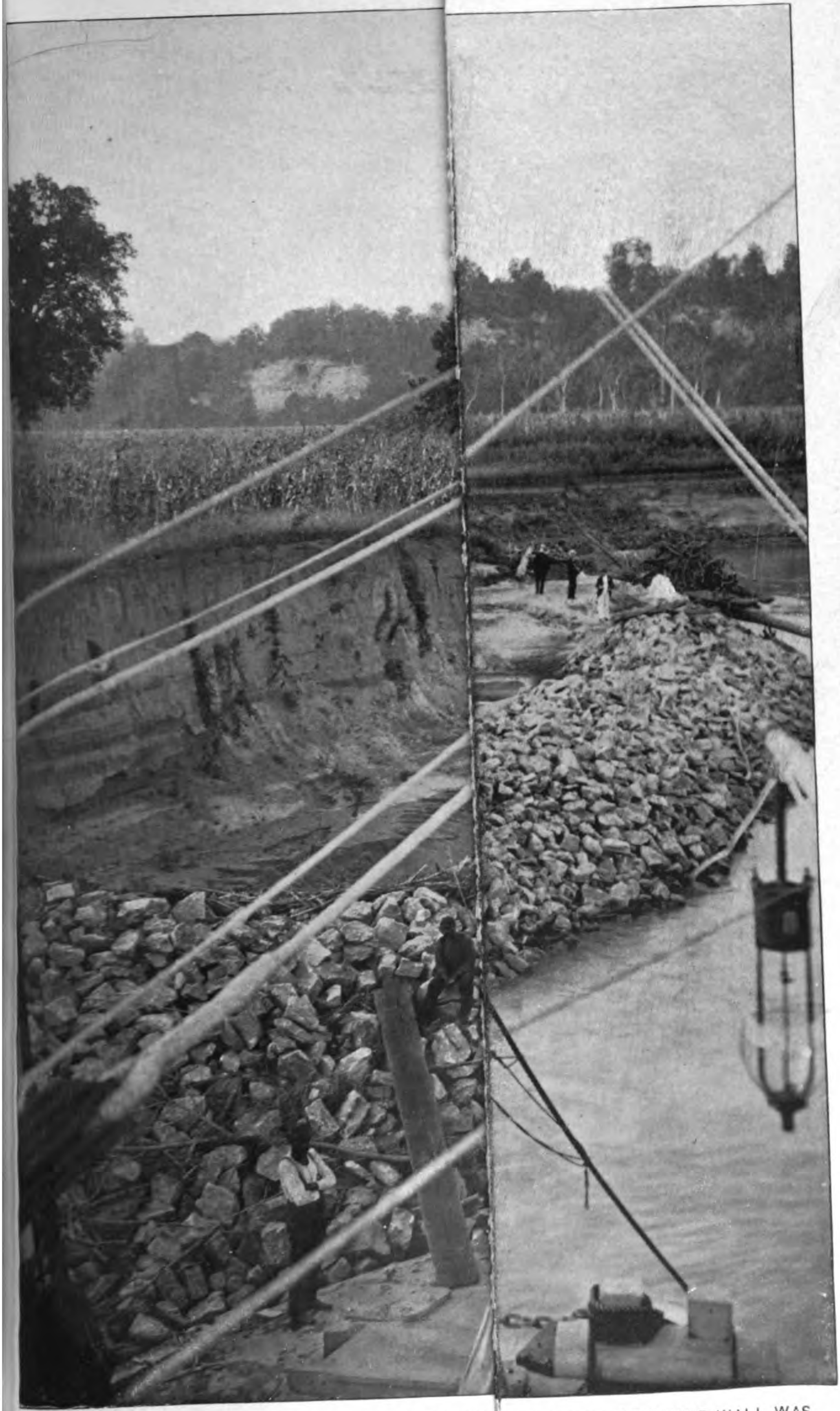
PLATE XXXII.



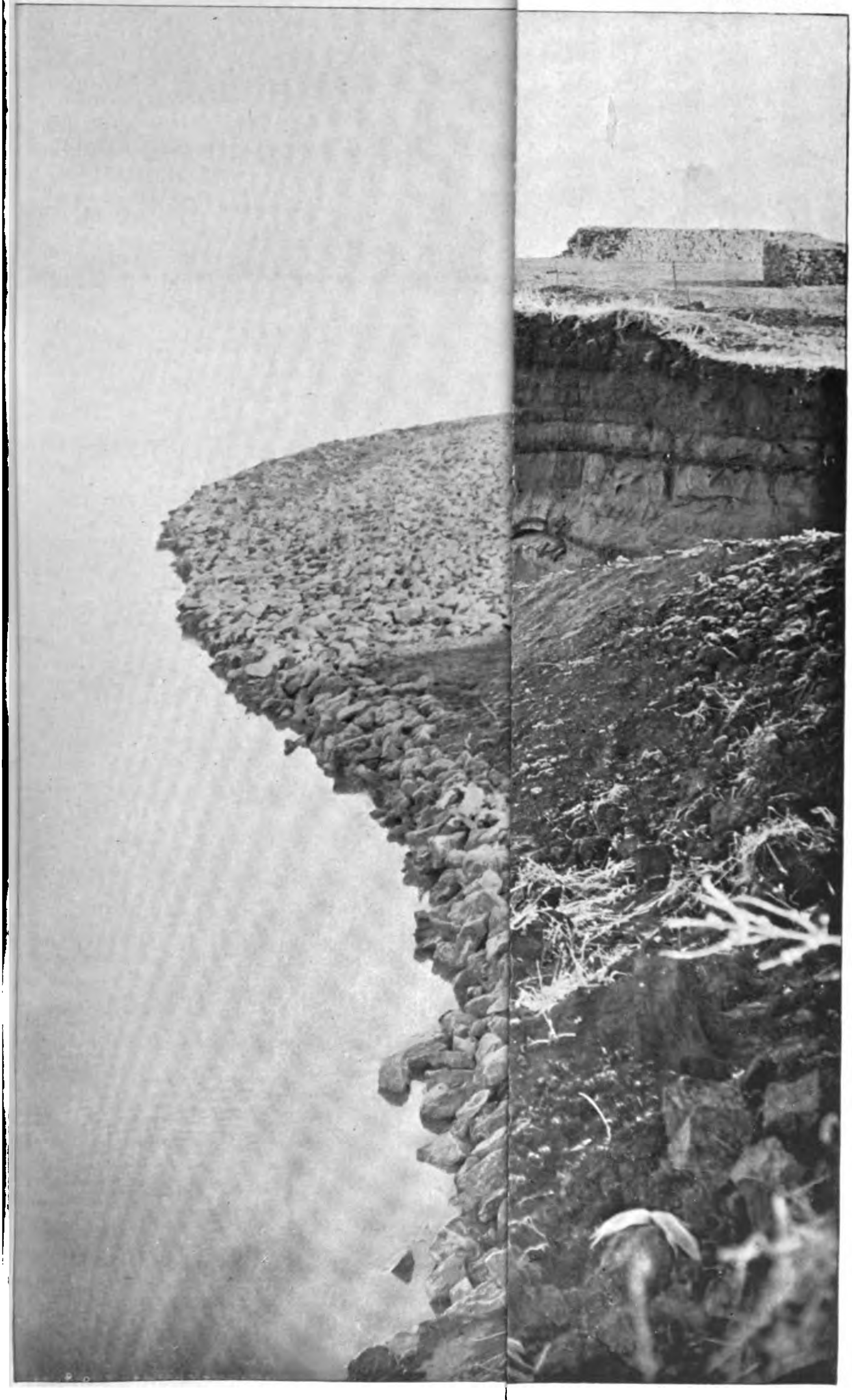
BANK HEAD 6 C. FROM POINT JUST ABOV KEN NOVEMBER 10, 1898.



BANK HEAD 6 C. FROM POINT JUST BELOW TAKEN NOVEMBER 10, 1898.

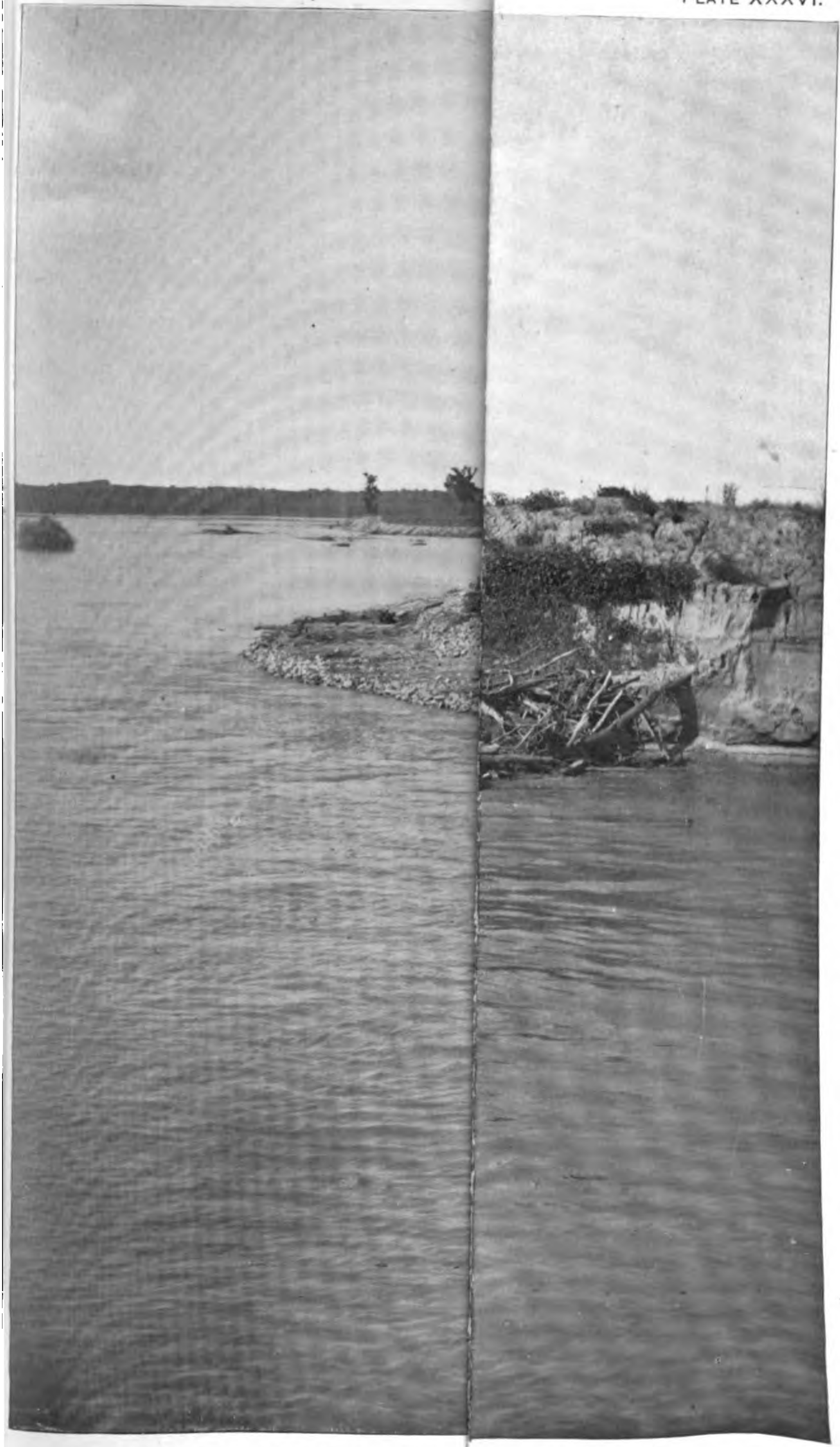


BANK HEAD 1 D. LOOKING UPSTREAM FROM ROO HE BOTTOM OF STONE WALL WAS 10 FEET ABOVE S. L. W. THE STONE KEN AUGUST 30, 1898.

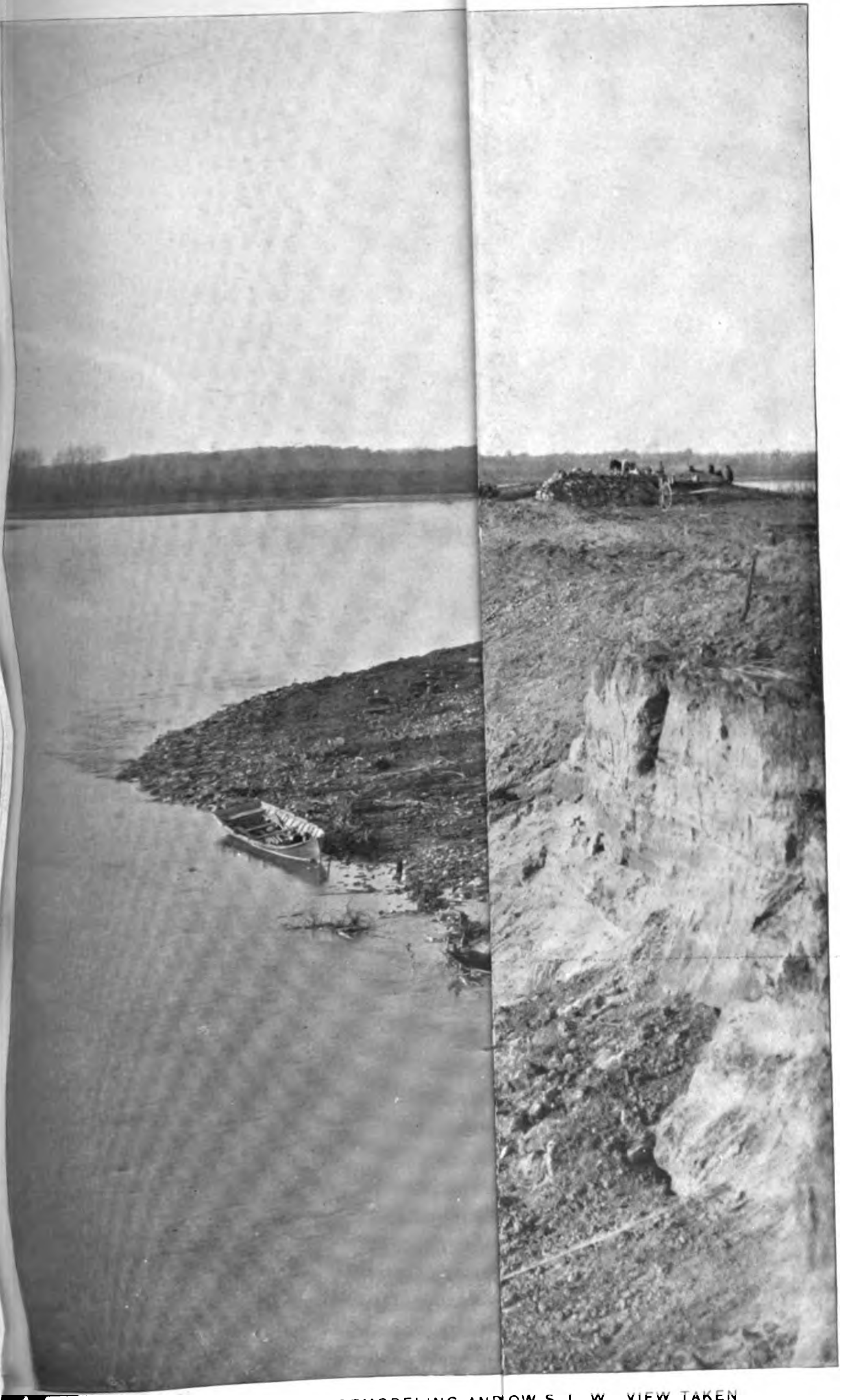


BANK HEAD 1 D, AS RE . 1898.

PLATE XXXVI.



BANK HEAD 6 F. FROM POINT ABO N SEPTEMBER 1, 1898.



BANK HEAD 6F. AFTER REMODELING AND LOW S. L W. VIEW TAKEN

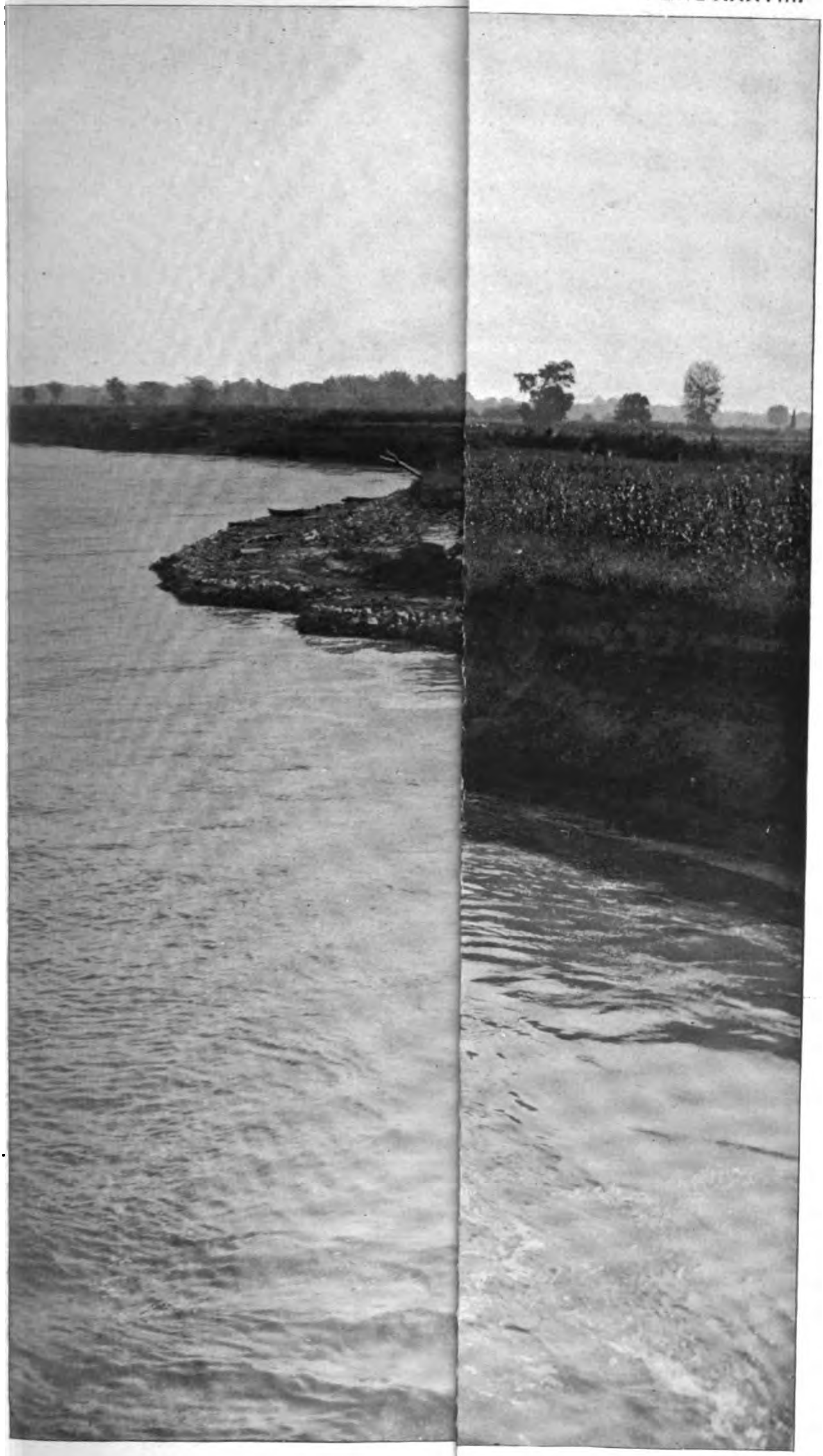
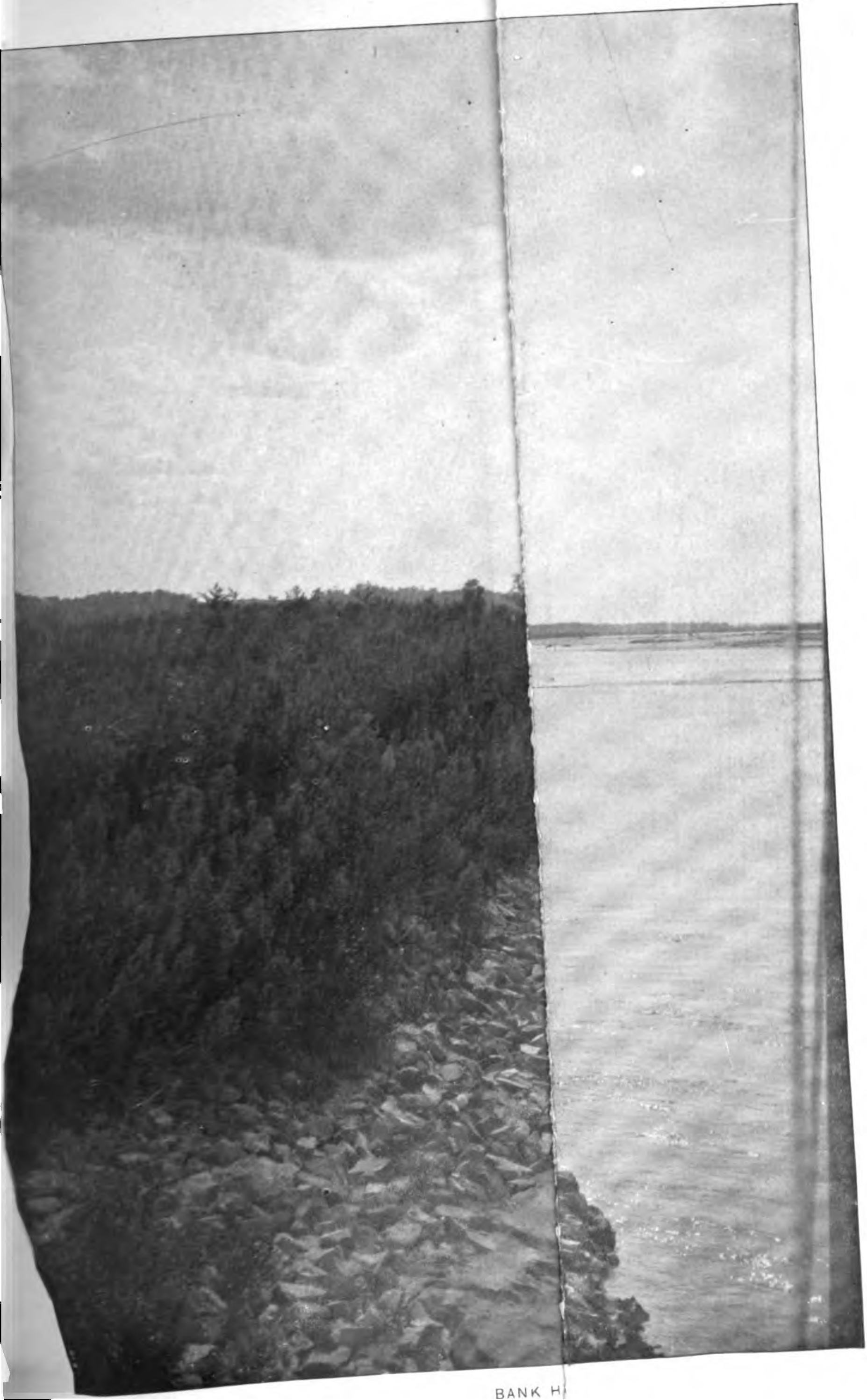
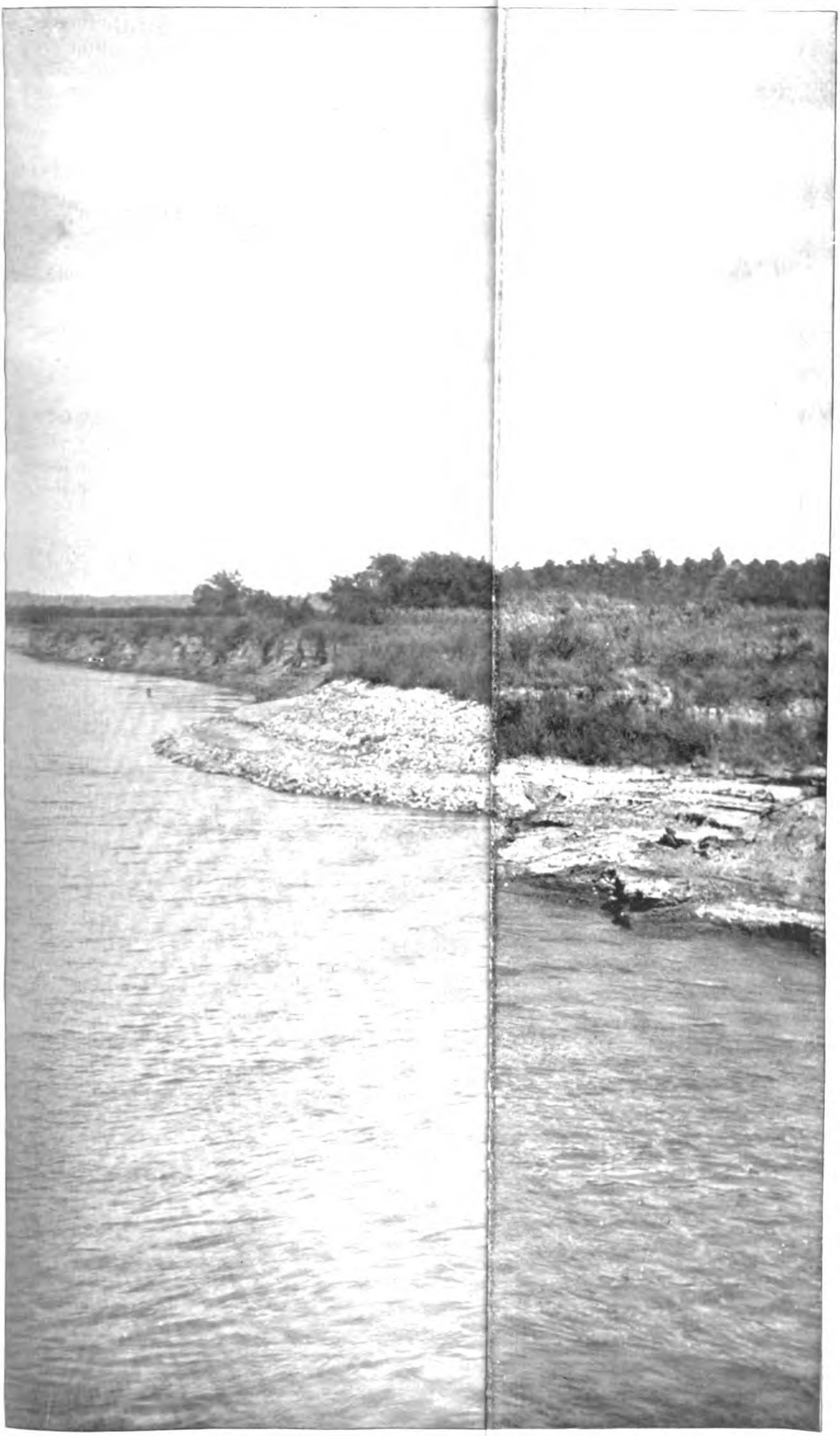


PLATE XXXIX.

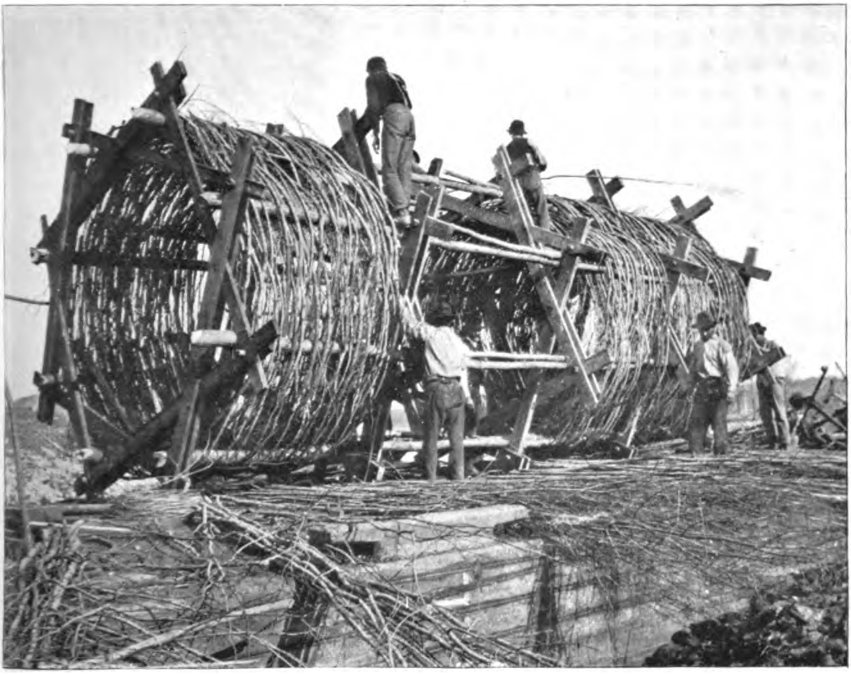


BANK H



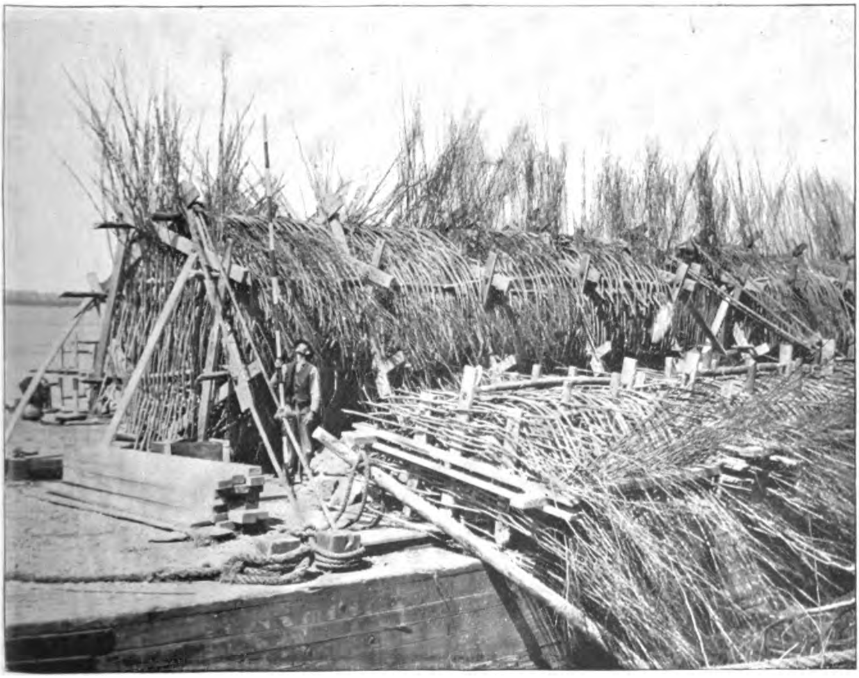
BA

MISSOURI RIVER COMMISSION, HOWARDS BEND REACH. PLATE XLI.



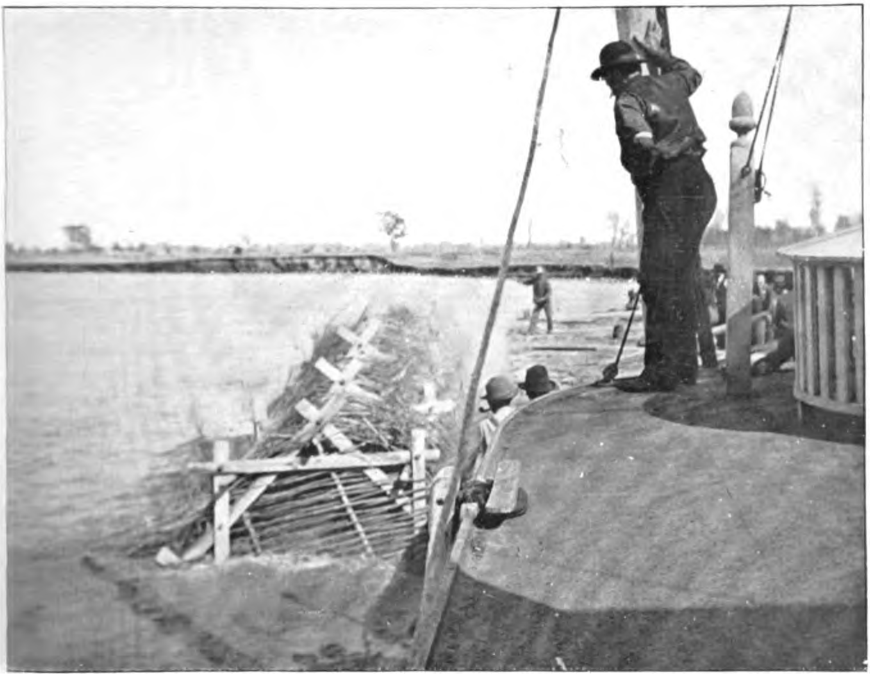
A GABION, 10½ FEET IN DIAMETER BY 30 FEET LONG, IN PROCESS OF CONSTRUCTION.
VIEW TAKEN APRIL 29, 1899.

MISSOURI RIVER COMMISSION, GLASGOW REACH. PLATE XLII.



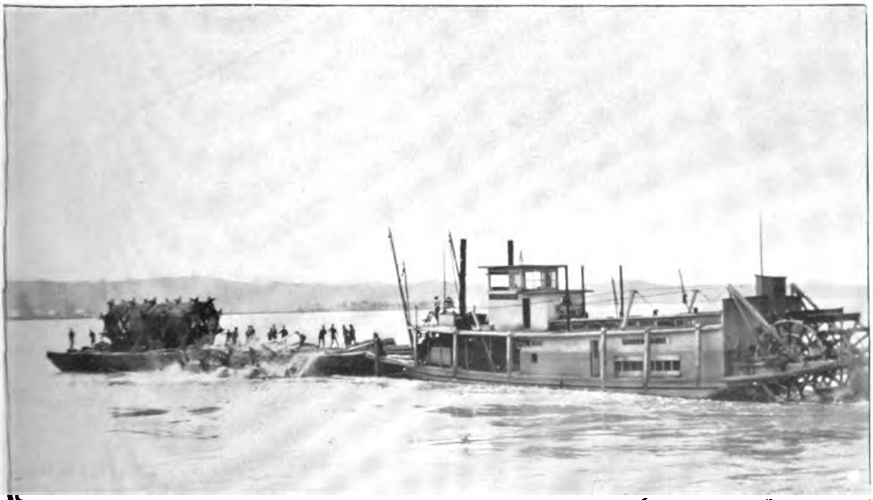
GABIONS AND BURRS, READY FOR USE IN GROIN CONSTRUCTION. VIEW TAKEN
APRIL 19, 1899.

MISSOURI RIVER COMMISSION, GLASGOW REACH. PLATE XLIII.



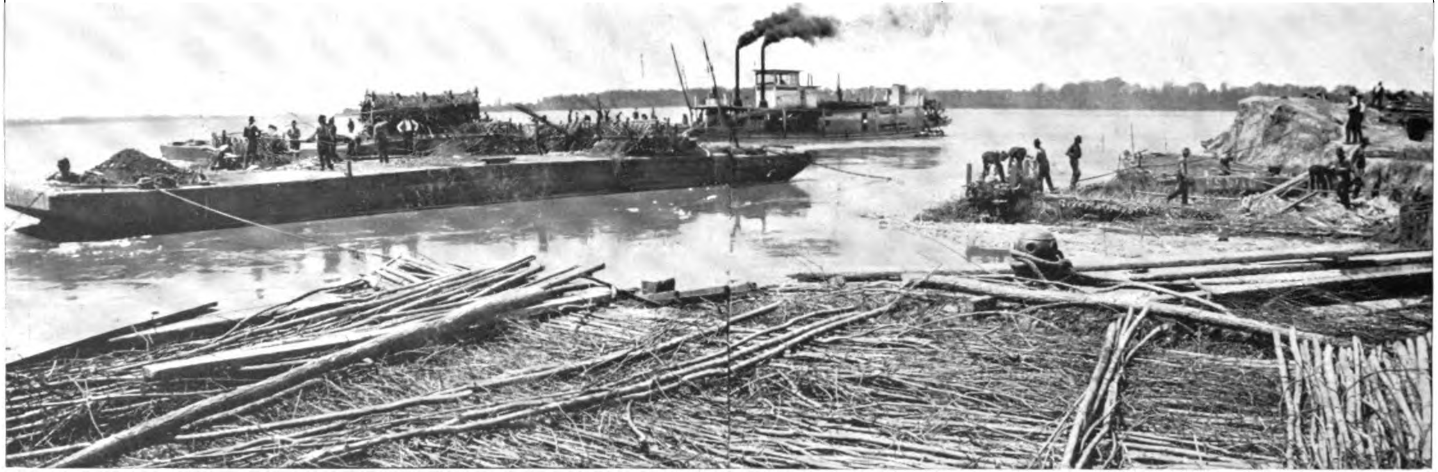
GROIN CONSTRUCTION. LAUNCHING A GABION IN GROIN NO. 2, BANK HEAD 5 C. VIEW TAKEN APRIL 24, 1899.

MISSOURI RIVER COMMISSION, HOWARDS BEND REACH. PLATE XLIV.

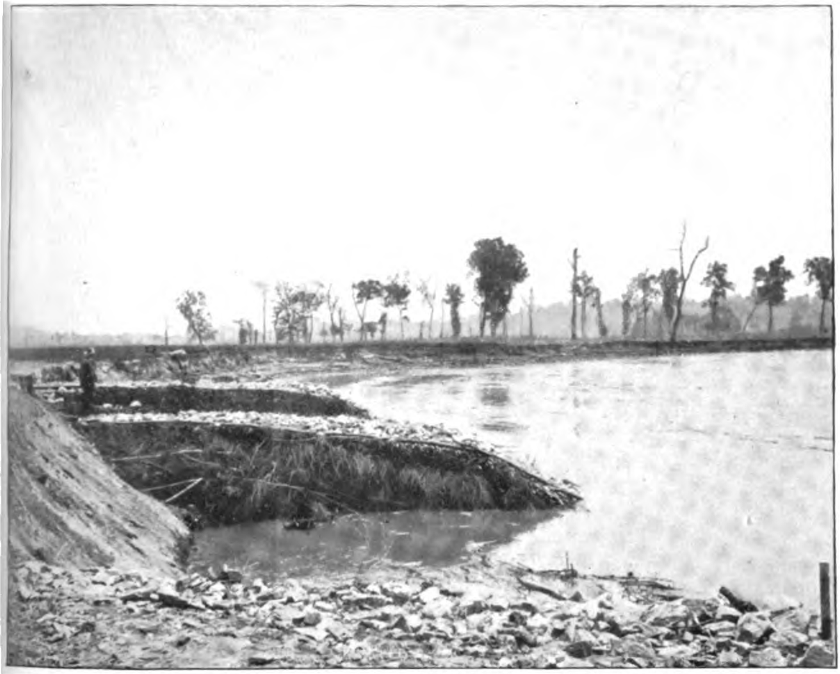


GROIN CONSTRUCTION, BANK HEAD 6 F. LAUNCHING A GABION IN GROIN B, 107 FEET OUT FROM POST CIRCLE. STAGE 14.6 FEET ABOVE S. L. W. VIEW TAKEN APRIL 29, 1899.

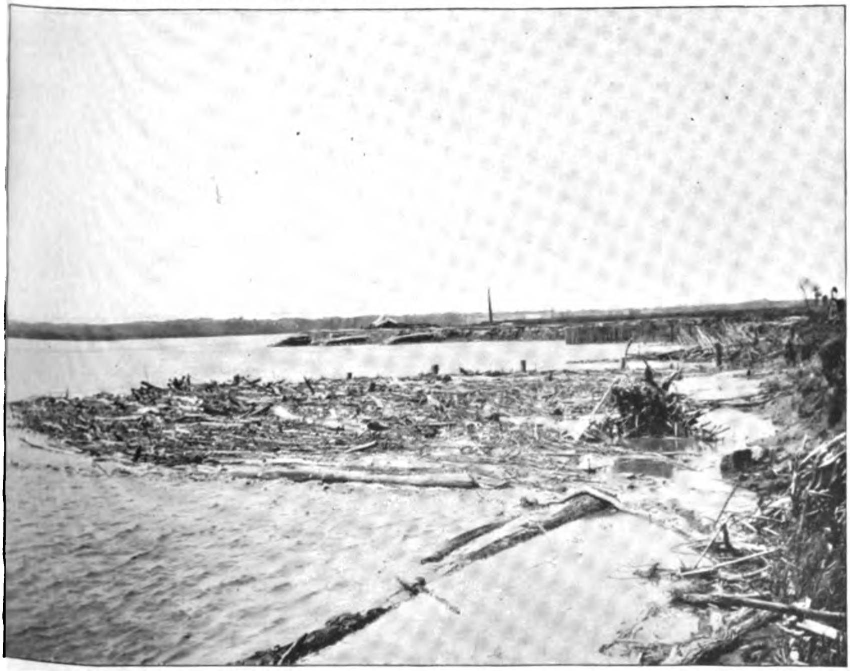
MISSOURI RIVER COMMISSION, HOWARDS BEND REACH. PLATE XLV.



GROIN BUILDING AT BANK HEAD 6 F. LOOKING DOWNSTREAM FROM POINT ON RADIAL NO 15, ABOVE NO. 0. PARTY IN MIDDLE-GROUND AT WORK ON GROIN A STAGE 14.75 FEET ABOVE S L. W. VIEW TAKEN APRIL 29, 1899

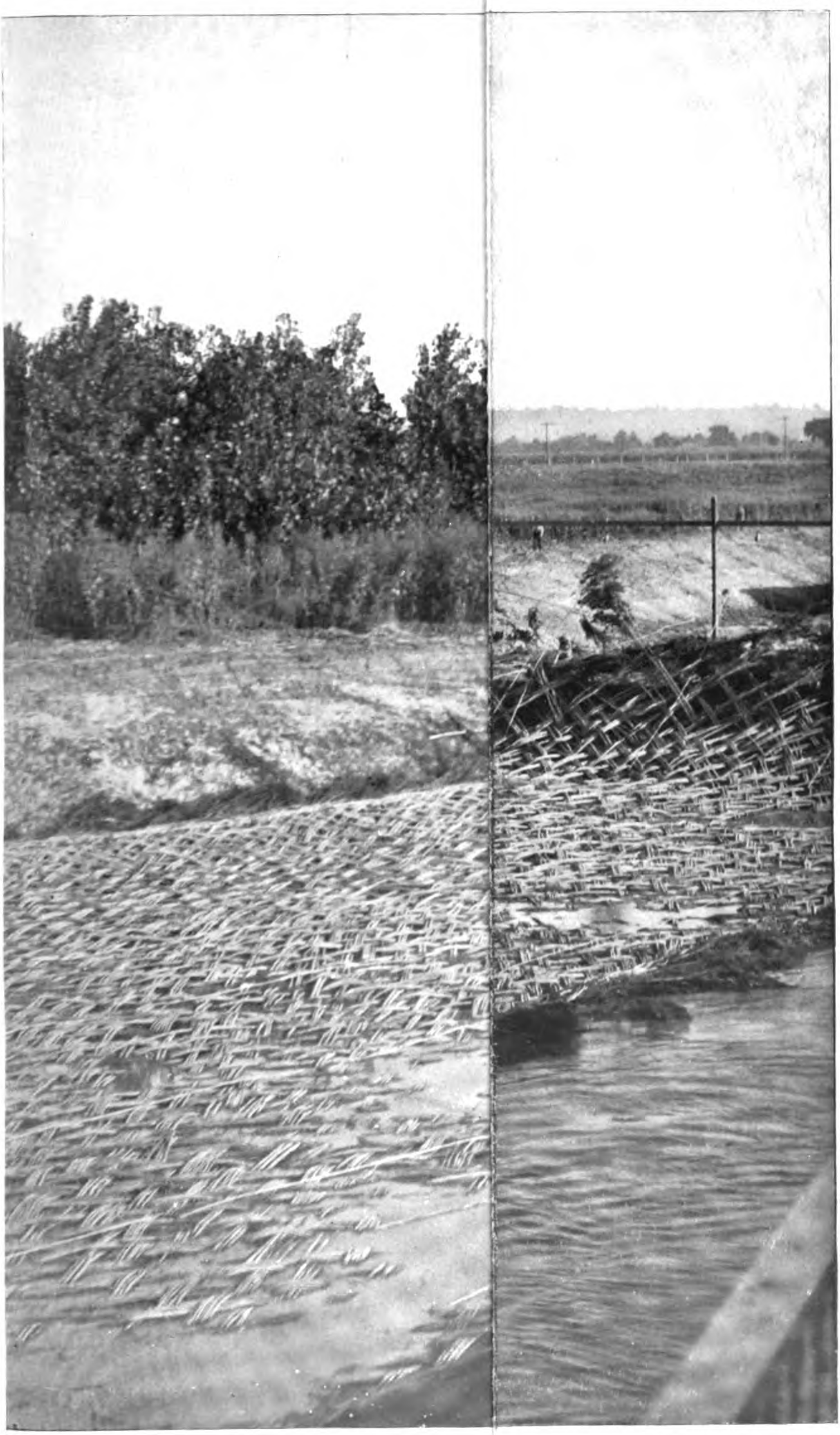


BANK HEAD 6 F. VIEW FROM POINT ON MAIN BANK, AT RADIAL 8, LOOKING UPSTREAM. SHOWING SPURS AT SHORE ENDS OF GROINS B AND A. IN THE FOREGROUND IS SHOWN A PORTION OF THE GROIN ON RADIAL 6. STAGE 10.2 FEET ABOVE S. L. W. VIEW TAKEN MAY 24, 1899.



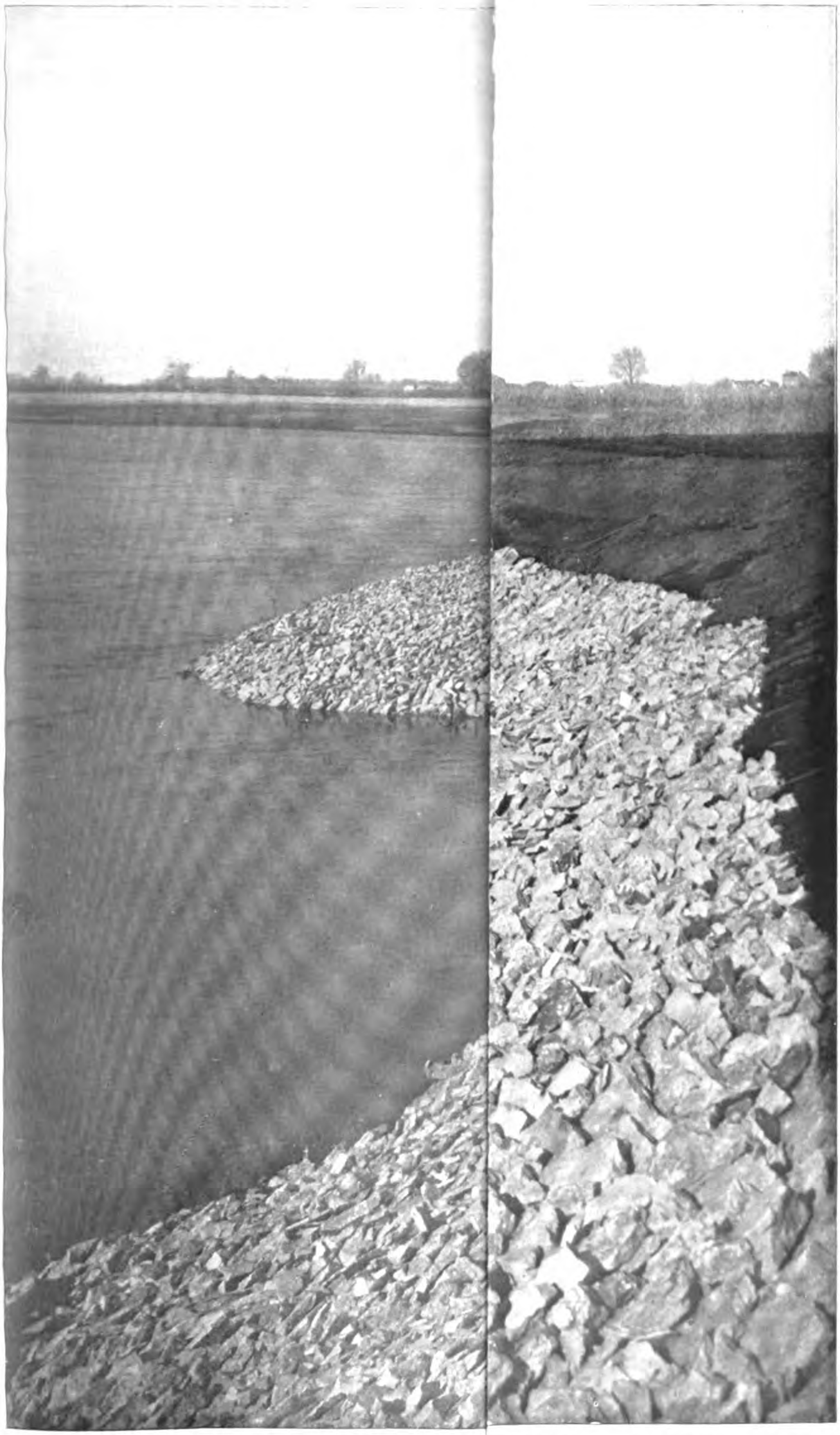
BANK HEAD 6 F. VIEW FROM POINT ON BANK 230 FEET ABOVE LINE OF ABATTIS, LOOKING DOWNSTREAM. THE DRIFT IN FOREGROUND RESTS AGAINST ANCHOR PILES OF ABATTIS. STAGE 12.15 FEET ABOVE S. L. W. VIEW TAKEN JUNE 18, 1899.

PLATE XLVIII.



PELICAN BEND SHOWING CONS PTEMBER 2, 1898.

PLATE XLIX.



PELICAN BEND REVETMENT FROM A POINT NEA OMPLETED DECEMBER 5, 1898, WAS

was transferred to work under the Mississippi River Commission, where I remained till May 16, 1899, when I resumed my position in charge of the work here.

The river and harbor bill of March 3, 1899, contains an item appropriating $25,000 for continuing the improvement of the Osage River; also authorizing the Secretary of War to enter into a contract for the completion of Lock and Dam No. 1, the amount of the contract not to exceed $146,000.

In accordance with the above provision, bids for the work were called for, and opened May 6, 1899. A contract was entered into May 16, 1899, with the lowest bidders, James S. Pollard and Joseph D. Wallace, of Champaign, Ill.

The contractors started a small force at work at the lock about June 1, and the force has gradually increased till at the end of the year a force of 25 to 30 men are employed.

The temporary buildings have been repaired and extended, machinery overhauled, and a considerable amount of excavation done for the abutment at the south end of the dam. I am informed that subcontracts for the iron, cement, piles, and a portion of the lumber required have been let, and the delivery of the material will begin very soon. The subcontract for the ironwork has been entered into with the Kenwood Bridge Company of Chicago. An inspection was made of their facilities for doing the work on June 9, and a number of samples of steel of sizes to be used were procured from their stock yard. Tests were made of these samples and the material found to be of a superior quality and entirely satisfactory,

Detail plans for the lock gates, emptying and filling valves, maneuvering gear for the gates, and plans for the dam, with all controlling mechanism, have been made and checked over, and requisitions made for such material as is to be furnished by the Government.

Very respectfully, your obedient servant,

F. B. MALTBY, *Assistant Engineer.*

Capt. HIRAM M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary Missouri River Commission

APPENDIX I.

ANNUAL REPORT ON THE GASCONADE RIVER, BY MR. F. B. MALTBY, ASSISTANT ENGINEER.

MISSOURI RIVER COMMISSION,
Osage City, Mo., June 22, 1899.

CAPTAIN: I have the honor to submit the following report of operations on the Gasconade River for the year ending June 30, 1899:

Owing to a lack of appropriation no work of improvement has been done by the Government on the river since the summer of 1896. (See Report of 1897.) The river and harbor act of March 3, 1899, contained the item, "Improving Gasconade River, Missouri: Continuing improvement, $15,000."

Supervision of the improvement contemplated was placed under my direction by you on May 17, 1899.

Mr. S. F. Crecelius, assistant engineer, was placed in direct charge on May 22, 1899, on his resuming his position with the Missouri River Commission after being mustered out of the United States Army as captain of the Third Regiment of Volunteer Engineers. Since assuming charge of the work several interviews have been had with the steamboat men interested in the navigation of the river, to ascertain their wishes as to the work to be done. An examination has been made of the river from its mouth to the head of Priors Bend. A project for the season's work, with an estimate of cost, has been prepared, and it is hoped that it will be possible to begin operations early in the coming month.

Very respectfully, your obedient servant,

F. B. MALTBY, *Assistant Engineer.*

Capt. H. M. CHITTENDEN,
Corps of Engineers, U. S. A.,
Secretary Missouri River Commission.

APPENDIX Y Y.

ANNUAL REPORT OF THE CALIFORNIA DÉBRIS COMMISSION FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

CALIFORNIA DÉBRIS COMMISSION,
San Francisco, Cal., July 1, 1899.

GENERAL: The California Débris Commission has the honor to submit the following annual report for the fiscal year ending June 30, 1899. Previous reports of the Commission may be found as follows:

1894, Report of Chief of Engineers, U. S. A., pp. 3169 to 3177.
1895, Report of Chief of Engineers, U. S. A., pp. 4049 to 4075.
1896, Report of Chief of Engineers, U. S. A., pp. 3861 to 3874.
1897, Report of Chief of Engineers, U. S. A., pp. 3961 to 3980.
1898, Report of Chief of Engineers, U. S. A., pp. 3549 to 3569.

The Commission was created by act of Congress approved March 1, 1893. During the past year its members have been the following officers of the Corps of Engineers, viz: Col. Chas. R. Suter, from July 1 to November 1, 1898; Col. S. M. Mansfield, from November 1, 1898, to June 30, 1899; Maj. W. H. Heuer and Lieut. Herbert Deakyne for the entire year. Col. Suter was president of the Commission to November 1, 1898, and Col. Mansfield was president from November 14, 1898. Lieut. Deakyne was secretary for the entire year.

The State Débris Commissioner, the Hon. John F. Kidder, has been present at most of the sessions of the commission held during the year.

Mr. Hubert Vischer, civil engineer, has been in the employ of the commission throughout the year, inspecting the operations of mines working under permits from the commission, looking after illegal mining in the district under the commission's jurisdiction, and conducting the investigation of a site for a restraining dam in the Yuba River.

The jurisdiction of the commission extends to hydraulic mining in that portion of the State of California drained by the Sacramento and San Joaquin River systems.

The duties of the commission may be briefly stated to be: First, the prevention of such hydraulic mining as may be deemed injurious to the navigable waters within the commission's jurisdiction, permitting, under proper regulation, such mining in cases where it can be carried on without such injury; second, to mature general plans for the improvement of the rivers whose navigability has been injured by hydraulic mining, and, if practicable, to devise general methods whereby such mining may be carried on without damage to the navigable waters.

PREVENTION OF ILLEGAL MINING.

In accordance with the opinion of the Attorney-General of the United States (Appendix A, House Ex. Doc. No. 11, Fifty-third Congress, third session), the commission has, since the date of its last annual report (July 1, 1898), called the attention of the owners and operators of six mines, which were being worked illegally, to the requirements of the law and the duties of the commission in the matter. These mines are all small, and, so far as known, have been closed.

On June 8, 1897, the commission received notice from the United States district attorney that the injunction suit requested by the commission on December 4, 1894, against the North Bloomfield Mining Company, had been decided by Judge Ross, of the United States circuit court, in favor of the United States, and that the injunction had been issued. On June 22, 1897, the commission was informed that an appeal had been taken by the North Bloomfield Mining Company and that their motion to vacate the injunction pending the appeal had been granted. No further official information concerning the case has been received, but a report was published more than a year ago by the newspapers, stating that the appeal had been decided in favor of the United States.

APPLICATIONS AND PERMITS.

The commission has, since it organized, received 430 applications to mine; 338 permits have been granted. A table showing a synopsis of the applications received and the action taken is appended and marked A.

Thirteen permits have been canceled and 31 permits have been at different times temporarily suspended, generally on account of the neglect of the owners to comply with instructions concerning the impounding works, or from accidents to those works.

No considerable failure of impounding barriers has come to the notice of the commission during the year.

The total amount of material mined under permits during the year is estimated at 638,499 cubic yards. The available storage provided at present and partially or wholly completed for future operations is estimated at 7,500,000 cubic yards.

The requirements in respect to storage of detritus exacted by the commission during the past year have been the same as those during the previous year.

No dam for impounding detritus in the larger streams has as yet been authorized by the commission. The investigation of a site for such a dam is being made in the Yuba River. The services of the assistant engineer employed by the commission have been devoted during a large part of the past two years to the collection of data on the Yuba River. The records of previous investigations have been studied and a large amount of field work has been done. A careful survey of the canyon known as the Narrows of the Yuba River was made. Borings were made with great difficulty to determine the depth of the gravel deposits in the river at this place. Investigations have been made in the lower part of the river, between the Narrows and the city of Marysville, and in the country adjacent to the river, in order that before proceeding to mature final plans the commission might possess full information on the subject.

The commission expects to submit a special report of its investigations and plans as soon as they are completed.

IMPROVEMENT OF RIVERS.

The duty of devising plans for the improvement of the rivers concerned devolves upon the commission by section 4 of the act. A board has since been appointed, in accordance with the act of Congress approved June 3, 1896, and charged with the duty of preparing plans for the improvement of Sacramento and Feather rivers.

The act of Congress approved June 3, 1896, also appropriated $250,000 for the construction of restraining barriers for the protection of the Sacramento and Feather rivers, and provided that the Treasurer of the United States should be authorized to receive from the State of California any and all sums appropriated or to be appropriated by the State for the same purpose, such sums to be expended with the Federal appropriation.

The legislature of the State of California on March 17, 1897, passed an act appropriating $250,000 to be used in conjunction with the above appropriation of the United States. Owing to legal obstacles in the way of payment of any money by the State treasurer of California to the Treasurer of the United States, this money can not be received by the Treasurer of the United States, but must be paid from time to time by the State officers to some person or persons designated by the California Débris Commission, presumably to the person or persons who have actually performed work on restraining barriers. The sundry civil bill approved July 1, 1898, contains a provision that will render this money of the State of California available.

Money statement.

July 1, 1898, amount appropriated by act of July 1, 1898, for "Expenses of California Débris Commission, 1899"	$15,000.00
Amount expended during the fiscal year ending June 30, 1899	10,745.99
Amount unexpended on June 30, 1899	4,254.01
Outstanding liabilities	1,076.30
Balance (reverted to Treasury)	3,177.71
July 1, 1899, amount appropriated by act of March 3, 1899, for "Expenses of California Débris Commission, 1900"	15,000.00
Amount estimated to be necessary for expenses of California Débris Commission for the fiscal year ending June 30, 1901	15,000.00

Respectfully submitted.

S. M. MANSFIELD,
Colonel, Corps of Engineers.
W. H. HEUER,
Major, Corps of Engineers.
HERBERT DEAKYNE,
First Lieut., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

APPENDIX A.

Synopsis of applications for authority to mine, with action taken thereon.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1893.			*Cu. yds.*	*Cubic yds.*
1	Kelly Hill *a*	Butte	R. M. Mooer	Sacramento	Rock dam 30 feet high in dry ravine; side spillway cut in rock.	1,000,000	Aug. 2	Sept. 9, 1893	Mar. 27, 1894	9,000	....
2	Farrel *b*	Nevada	Eureka Lake and Yuba Canal Co.	Middle Yuba	Dam 12 feet high of earth and logs across mouth of old hydraulic pit.	212,000	Aug. 11	Works already built	Sept. 8, 1893	177,972	....
3	Omega *c*	....do	N. C. Tully	South Yuba	Dam 60 feet high in Scotchman Creek of brush and gravel; side spillway cut in rock.	2,160,000	Aug. 16	Sept. 9, 1893	Nov. 11, 1895	....	....
4	Brandy City	Sierra	A. Steinberger	Middle Yuba	Brush and earth dam across mouth of old hydraulic pit.	1,520,000	Sept. 19	Oct. 25, 1893	Oct. 9, 1894	99,800	856,000
5	Blue Nose *d*	Plumas	B. Below	Middle Feather.	Stone dam in Hopkins Creek.	50,000	....do	....	....	....	....
6	Blue Gravel *b*	Yuba	Excelsior Water and Mining Co.	Yuba	Old hydraulic pit with tunnel stopped with rock.	604,000	Sept. 27	Works already built	Oct. 17, 1893	529,614	....
7	Illinois Gold Gravel. *e*	Plumas	H. Buckley & Louis L. Hillman.	....do	....do	35,000	Sept. 29	Jan. 4, 1894	Jan. 31, 1894	7,951	94,000
8	New York Gold Gravel.	Sierra	Westall & Hughes	South Yuba	Brush, log, and earth dam, Howard Creek; spillway in rock.	484,000	Oct. 12	Nov. 21, 1893	Dec. 5, 1893	46,000	34,000
9	Corbiere & Bean.	Butte	Corbiere & Bean	North Yuba	Rock dam 10 feet high in Hampshire Creek.	12,000	Oct. 9	Works already built	Nov. 21, 1893	11,300	2,500
10	Phœnix Gold Gravel.	Sierra	W. A. & M. E. Schofield.	....do	Dams, Whisky Creek and North Fork of Slate Creek.	1,660,000	Oct. 14	June 27, 1894	....	....	....
11	Eureka Mining Co.	....do	Eureka Mining Co.	....do	Timber dams in Saw Mill Ravine.	553,000	Oct. 15	Nov. 21, 1893	May 29, 1894	59,120	40,000
12	Craycroft Mining Co.	....do	Craycroft Mining Co.	....do	Timber dams, Hughes and Davidson ravines.	140,000	....do	....do	....do	54,000	3,000
13	Excelsior Hydraulic.	....do	Excelsior Mining Co.	....do	Timber dams, Eagle Gulch and Smith Flat.	277,000	....do	....do	....do	31,000	4,000

14	Spanish Ranch	Plumas	Quincy Mining and Water Co.	North Feather	Timber dams, Spanish Creek and old hydraulic pit.	8,000,000	Oct. 18				
15	Gopher Hill *b*	....do	....do	....do	....do	2,000,000	....do	Dec. 6, 1893	Apr. 14, 1894	384,701	
16	Polar Star *b*	Placer	John Spaulding	Bear	Stone and gravel dam in Little Bear River, with spillway.	605,000	Nov. 3	Works already built	Dec. 13, 1893	12,800	
17	Agate	Sierra	A. Denmire	North Yuba	Dams in Dry Ravine	17,000	Nov. 6	Dec. 13, 1893	Nov 20, 1894	4,025	16,725
18	Nevada *f*	....do	Geo. W. Cox	Yuba	Dams, North Branch Slate Creek.	10,000	Nov. 14	June 27, 1894			
19	Fifty-four Flat. *b*	Amador	Fifty-four Flat Mining Co.	Mokelumne	Brush dam in ravine	15,000,000	....do	Jan. 11, 1894	Feb. 6, 1894	34,446	
20	Red Hill	Shasta	Nathan Gardiner	Sacramento	Five dams in gulch	750,000	Nov. 16	Jan. 4, 1894	....do	17,730	15,000
21	Badger *b*	....do	W. R. Stewart	....do	Flat ground	2,500	Nov. 29	No works required.	Jan. 2, 1894	35	
22	First Chance	Sierra	Frank E. Barbero	North Yuba	Bowlder, log, and brush dam in Howard Creek.	200,000	Dec. 4	Works already built	....do	834	2,992
23	Tannery Ravine.	Yuba	W. R. Reed	Yuba	Log and brush dam in ravine.	9,000	....do	Jan. 4, 1894	Jan. 10, 1894	70	
24	Mateos' *b*	Sierra	Manuel Mateos	North Yuba	Westall & Hughes's dam, Howard Creek.		....do	Works already built	Jan. 2, 1894		
25	Davis	....do	Joseph Davis	....do	....do		....do	....do	....do	12,173	11,800
26	Christmas Hill. *f*	Placer	Hannah McKinstry, E. E. McKinstry, and E. E. Gilbert.	American		200,000	Dec. 5				
27	Walker *b*	Shasta	Olonzo Engle and F. Walker.	Sacramento	1 rock and 1 brush dam in Pomroy Gulch.	675,000	Dec. 8	Jan. 4, 1894	Jan. 31, 1894	1,076	
28	North Star *b*	Calaveras	Phil McGuire, P. McGuire, jr., and B. McGuire.	Mokelumne	Dams in Buckeye Gulch	500,000	Dec. 13	....do	Jan. 10, 1894	31,618	
29	Hustler *g*	Nevada	Jos. Hustler	South Yuba	Gravel dam in Gilroy Cut.	90,000	Dec. 17	Jan. 31, 1894	Aug. 13, 1894	19,850	
30	Green Mountain. *b*	Calaveras	J. W. Smith	Calaveras	Old hydraulic pit with brush dam.	250,000	....do	Jan. 4, 1894	Jan. 8, 1894	3,534	
31	Noonday *b*	Sierra	John Egbert	North Yuba	Flat near mine	40,000	Dec. 26	No works required.	Oct. 23, 1894	8,775	
32	Pomroy *b*	Shasta	John McGrew and Olonzo Engle.	Sacramento	Rock dam in Pomroy Gulch	1,400,000	....do	Works already built	Jan. 31, 1894	3,737	
33	Union *b*	Yuba	C. C. Beever	Yuba	Rock and brush dam, French Gulch.	3,200	....do	Mar. 7, 1894	Mar. 27, 1894	605	
34	Welch Placer *h*	Sacramento	Columbian Gold Mining Co.	Cosumnes	Stone dam	161,000	Dec. 27	Jan. 31, 1894	Feb. 10, 1894	428,000	
35	French Corral. *b*	Nevada	Kate Hayes Mining Co.	South Yuba	Old hydraulic pit	450,000	....do	....do	Mar. 13, 1894		
36	Manzanita *i*	....do	....do	Yuba	....do	1,159,500	....do	Apr. 10, 1894	May 1, 1894	833,200	
37	Campo *b*	Yuba	Fausteno Campo	....do	Rock dam in gulch	1,000	Dec. 29	Works already built	Mar. 7, 1894		
38	Herring Ravine. *b*	....do	J. M. Wetmore	....do	Rock and brush dam 1 mile below mine.	660	1894. Jan. 10	....do	....do	390	

a Mine closed; permit canceled.
b Mine closed.
c Permit canceled Apr. 12, 1897.
d Permit refused.
e Mine now operated by Sam Ahtye.
f Mine will not be worked.
g Permit canceled May 9, 1898.
h Mine worked out.
i Permit canceled Jan. 19, 1897.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1894.			*Cu. yds.*	*Cubic yds.*
39	Conduit Ravine. *a*	Yuba	W. W. & W. A. Lemon	....do	Rock and brush dam	10,000	Jan. 21	Mar. 7, 1894	....	....	....
40	Motor *b*	....do	Jas. Gordon	....do	Old water reservoir	10,000	....do	No works required.	Mar. 7, 1894	200	....
41	Spring Gulch *b*	Calaveras	J. S. White	Calaveras	Old reservoir and dams, Spring Gulch.	545,000	Jan. 31	Works already partly built.	Mar. 13, 1894	27,100	....
42	Crane Bros. *c*	Yuba	Crane Bros	Yuba	No impounding works required.	1,000	Feb. 5	No works required.	Mar. 7, 1894	973	....
43	Indian Hill *d*	Plumas	F. Eyraud and Jean Lassier.	Feather	Dam across natural depression.	118,000	Feb. 6	....	....	....	....
44	Badger Hill	....do	E. B. Jacks	....do	Quincy Mining and Water Co.'s dam in Spanish Creek.	100,000	Feb. 7	....	....	....	....
45	Snow Bros	Eldorado	Snow Bros	American	Timber and brush barrier in Webber Creek.	903,000	Feb. 13	Works already built	Apr. 3, 1894	73,500	68,000
46	Green Meadow	Calaveras	H. B. Havens	Mokelumne	Brush dams in gulch	93,000	Feb. 15	Mar. 14, 1894	Apr. 17, 1894	27,345	5,000
47	Grub Flat *e*	Plumas	John Tucker and S. C. Brown.	Feather	Brush and log dam in old pit.	20,000	....do	Apr. 10, 1894	Apr. 14, 1894	5,615	10,000
48	Oriental and Tahoe.	Nevada	Jas. Hackett	Yuba	Brush dam in swale and brush barrier on sloping plain.	56,000	....do	Apr. 3, 1894	Aug. 6, 1894	1,340	2,000
49	Eureka Hydraulic. *b*	Eldorado	Pascoe & Gruben	American	Brush dam in Chili Ravine	24,200	Feb. 19	....do	Apr. 10, 1894	20,100	....
50	Spanish Hill Hydraulic. *b*	....do	Eldorado Water and Deep Gravel Mining Co.	....do	2 brush dams in Spanish Ravine.	129,000	....do	Mar. 28, 1894	....do	5,250	....
51	Spanish Hill Gravel. *b*	....do	Thos. Alderson	....do	Brush dam on flat	193,000	....do	....do	....do	....	....
52	Cleveland *f*	Sierra	D. Perkins	North Yuba	Log dam, Rock Creek	125,000	Feb. 24	June 27, 1894	Nov. 27, 1894	20,100	30,000
53	Dutra, Wilder & Co.	Yuba	Lewis Wilder	Yuba	Rock dam across ravine	120,000	Mar. 5	Oct. 23, 1894	Feb. 5, 1895	1,200	3,200
54	Mitchell Hydraulic. *b*	Eldorado	Robert, James, and John Blair.	American	Brush and gravel dam in Ravine.	1,161,000	Mar. 7	Oct. 9, 1894	Oct. 23, 1894	11,813	....
55	Stewart Hydraulic.	....do	John Melton	....do	Brush dam in ravine	7,250	Apr. 3	Works already built	May 1, 1894	....	....
56	Nip and Tuck *b*	Butte	Dickhouse Bros	Feather	Dam on flat in Robinson ravine.	12,700	Apr. 19	Sept. 25, 1894	Oct. 2, 1894	1,000	....

57	Concordia[g]	Plumas	L. V. Tefft	do	Dams, Cogswell Ravine and Jackson Creek.	1,450,000	May 16	July 8, 1894			
58	Northern placer.[b]	do	Northern Placer Mining Co.	do	Dams, Little Long Valley Creek.	100,000	do	June 27, 1894	Nov. 6, 1894	24,400	
59	Schuyler[b]	Shasta	Thos. White	Sacramento	1 rock and 2 brush dams in Dry Creek.	296,800	June 5	Works already built.	July 23, 1894	11,450	
60	Hayes & Steelman.	Sierra	Philip Hayes	Feather	Log and brush barriers in excavations.	150,000	June 12	Oct. 23, 1894			
61	Mohawk	Plumas	Stephen Soracco	do	Log and brush dam in ravine.	16,000	July 17	Aug. 14, 1894	Mar. 30, 1896	466	5,000
62	William Tell[d]	do	Frank F. Vanzini	do	Log and brush dam in Yankee Ravine.	24,000	do	do			
63	Garfield Flat	do	Peter Lorenzo	do	do	30,000	do	do	Nov. 6, 1894	2,624	2,400
64	Grizzly Bear[h]	do	Nicola Rossi	do	Common reservoir	80,000	do	do	do	5,037	
65	Howard	Shasta	James Regan and J. M. Lowe.	Sacramento	Two brush dams in ravine	4,500	July 18	Oct. 22, 1894			
66	China Hill	Amador	Consolidated Amador Volcano Hydraulic Gold Mining and Land Company of California.	Mokelumne	Log and brush dam in south branch of Sutter Creek.	968,000	July 25	Aug. 14, 1894	Nov. 13, 1894	7,739	15,000
67	Elephant	do	do	do	Log and rock dam in Dry Gulch.	330,000	do	do			
68	Steel & Co.	Yuba	T. H. Steel	Yuba	Stone dam on New York Flat.	145,000	do	Works already built	Sept. 25, 1894	92,700	50,000
69	Jas. Watson	Shasta	J. C. Voluntine	Sacramento	Brush dam, Dry Creek and Jackass Gulch.	1,000,000	July 30	Oct. 9, 1894	Mar. 12, 1895	238,800	100,000
70	Volcano Gold Gravel.[b]	Amador	Volcano Gold Gravel Mining Co.	Mokelumne	Log and brush dam in Sutter Creek.	32,000	Aug. 16	Sept. 18, 1894	Nov. 13, 1894	15,000	
71	Holoway	Plumas	J. S. Gould and F. M. Spencer.	Feather	Log and brush dam in canyon.	30,000	Sept. 5	Works already built.	Nov. 20, 1894	35,000	34,000
72	Mugginsville	Sierra	W. A. Morse	North Yuba	Crib dam in Eureka Creek.	450,000	Sept. 7	Oct. 30, 1894	Nov. 11, 1895	32,000	10,000
73	Waukshaw	Nevada	John R. Jones	South Yuba	Rock dam in canyon	150,000	Sept. 10				
74	U. S. Grant[i]	do	E. P. Hagar and Samuel Peck.	do	Three brush dams in canyon.	25,000	Oct. 23	Nov. 27, 1894	Dec. 17, 1894	3,300	
75	Richmond Hill.[b]	Plumas	Good Hope Mining Co.	Feather	Log crib dam in Onion Valley Creek.	72,000	Oct. 24	do	Nov. 18, 1895	98,066	
76	Pine Grove[i]	Amador	Ben Hur Mining Co.	Mokelumne	Brush dam, Sawmill Gulch	25,000	Nov. 8	do	Jan. 8, 1895	4,000	
77	Hidden Treasure.[b]	do	Chas. G. Haskin	do	Log and rock dam in Grass Valley Creek.	30,000	do	do	Mar. 30, 1896	23,066	
78	Martelle[b]	Eldorado	Leonard Dormody	American	Martelle Creek	30,000	Nov. 3	Jan. 22, 1895	Feb. 18, 1895	200	
79	Gold Run	Placer	Gold Run Ditch and Mining Co.	do	Two rock dams, north fork of American River.	11,655,000	do				
80	Spanish John	Nevada	John Black	Yuba	Log and brush dams in blind ravines.	121,000	Nov. 8	Nov. 27, 1894	Dec. 17, 1894	24,600	10,000
81	North Rim[b]	Placer	G. H. Pease and J. B. Colwell.	American	Dam, Mexican Gulch	10,000	Nov. 20	Feb. 12, 1895	Feb. 26, 1895	4,000	
82	Crown Point[b]	Plumas	Crown Point Mining Co.	Feather	Log and brush dam in Porter Ravine.	45,000	Nov. 26		Apr. 15, 1895	2,850	

[a] Mine abandoned.
[b] Mine closed.
[c] Mine worked out.
[d] Permit refused November 6, 1894.
[e] Now operated by H. A. Hallsted.
[f] Now operated by Joel Bean.
[g] Permit refused February 23, 1897.
[h] Permit canceled August 23, 1897.
[i] Mine closed. Permit canceled.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1894.			*Cu. yds.*	*Cubic yds.*
83	Spring Valley *a*	Butte	Mariano C. Mello and John Costa.	Feather	Rock dam in Sawmill Gulch.	484,000	Dec. 3	Feb. 26, 1894	July 20, 1896	18,750	....
84	Kentucky Flat. *a*	Eldorado	H. E. Picket	American	Log and brush dam in North Otter Creek.	100,000	Dec. 5	Works already built.	Feb. 5, 1895	22,758	....
85	Johnson *b*	Amador	William Johnson	Sacramento	Brush dam in ravine	100,000	Dec. 10	Jan. 15, 1895	....	....	....
86	Henrietta *a*	Eldorado	Eldorado Water and Deep Gravel Mining Co.	American	.....do	7,000	Dec. 11	Works already built.	Jan. 22, 1895	750	....
87	Leroy Hedge	Yuba	Leroy Hedge	Yuba	Brush, log, and rock dam below mine.	2,500	Dec. 14	.....do	Feb. 5, 1895	500	2,800
88	Epley *a*	Eldorado	Louis Rolland and Alonzo Vanderberg.	American	Brush, gravel, and rock dam in ravine.	3,500	Dec. 18	.....do	Jan. 22, 1895	200	....
89	York Mining Co.	Yuba	York Mining Co	Yuba	Brush and log dam below mine.	4,000	Dec. 20	.....do	Feb. 5, 1895	11,275	20,000
90	Last Chance *a*	Eldorado	Edward Hancock and W. H. Daly.	American	Brush and gravel dams in Hancock Ravine.	50,000	Dec. 21	.....do	Jan. 22, 1895	8,060	....
91	Goodman & Bund *a*.	Amador	Goodman & Bund	Mokelumne	Timber and brush dam in Ashland branch of Sutter Creek.	100,000	Dec. 24	.....do	Jan. 14, 1895	5,250	....
92	Goodman Bros.	.....do	F. A. and W. H. Goodman.	.....do	.....do	50,000	....do	.....do	.....do	1,570	2,000
93	'49 Flat *a*	.....do	Hadley & Bolles	.....do	Log and brush dam in '49 Gulch.	250,000	Dec. 26	.....do	.....do	24,900	....
94	Fine Gold	Calaveras	G. A. Meincke, C. Sanguinette, and J. S. Shepard.	Stanislaus	Rock and brush dam in Skunk Ravine.	4,000	Dec. 27	Feb. 26, 1895	Mar. 5, 1895	63,750	6,000
							1895.				
95	American House. *c*	Plumas	A. Blair	Feather	Dams, American House Ravine.	2,500	Jan. 7	.....do	May 13, 1895	207	....
96	Central Hill Placer. *d*	Calaveras	William Thomas, sr., M. McCormick, W. A. Bisbee, and W. Thomas, jr.	Stanislaus	Rock and stone dams	1,000,000	....do	....	Mar. 25, 1895	14,380	....
97	Kate Gray *a*	Amador	Giovanni Rossi	Mokelumne	Brush dam	10,000	....do	Feb. 26, 1895	Mar. 5, 1895	600	....
98	Spring Tunnel and Spring Canyon.	Eldorado	Jay E. Russell	American	Brush dams, Spring Canyon.	56,000	Jan. 17	Apr. 23, 1895	....	....	....

99	Shealor *a*	Amador	J. E. Newsom	Mokelumne	Log, rock, and brush dam in Sutter Creek.	1,500	Jan. 29	Works already built.	Mar. 5, 1895	250	....
100	Railroad Hill Gravel.	Calaveras	Giani and Luigi Demartini.	Calaveras	Brush dam in Dry Gulch	48,000	Feb. 1	do	Feb. 26, 1895	13,020	5,000
101	James Slater	Yuba	James Slater	Yuba	York Mining Co.'s dam	30,000	Feb. 4	do	do	....	....
102	Grizzly Hill *a*.	Amador	Moy Jin Mun	Mokelumne	Brush dam in ravine	300,000	Feb. 12	Mar. 19, 1895	Apr. 8, 1895	180	....
103	Deer Valley *a*.	Eldorado	Wulff Bros	American	Log and brush dams and old pit.	5,000	Feb. 13	Works already built.	Mar. 18, 1895	....	....
104	Strawberry Placer.	Calaveras	John Enos	Stanislaus	Two rock dams in Dry Gulch.	8,000	do	do	do	1,855	1,590
105	Mount Gregory Gold.	Eldorado	Porter Philips	American	Brush and log dam in Dry Ravine.	200,000	Feb. 20	do	Apr. 22, 1895	800	1,000
106	Red Hill and Telegraph Hill.	Amador	Geo. R. Evans, John Erickson, and M. Fitzgerald.	Mokelumne	Log-crib dam in Chili Gulch.	15,000	Feb. 23	do	Mar. 18, 1895	7,810	2,150
107	Blacklock *a*	Eldorado	Geo. W. Edwards	American	Brush and gravel dam in Spanish Ravine.	403,000	Mar. 1	do	Apr. 1, 1895	4,740	....
108	Kelly & Matherly. *e*	Placer	M. A. Kelly and W. H. Matherly.	Sacramento	Worked-out pit, Rattlesnake Bar.	20,000	Mar. 5	....	....	....	....
109	Dry Gulch	Amador	O. M. Henry	....	Brush dam below mine	10,000	Mar. 7	Works already built.	Apr. 8, 1895	500	1,000
110	Sawmill Flat	Shasta	J. K. Williams	Sacramento	Worked-out pits	30,000	Mar. 8	Mar. 13, 1895	....	....	....
111	Mooney Placer. *a*	Eldorado	Thos. Ewing	American	Log and brush dams inclosing worked out pit.	968,000	Mar. 13	Works already built.	Apr. 1, 1895	3,000	....
112	Grizzly Flat *a*	do	Geo. Wheeler and Moses C. Wheeler.	Cosumnes	Log and brush dam on Grizzly Flat.	10,000	Mar. 16	Apr. 1, 1895	do	....	....
113	Gold Deposit	do	David Croft	American	Retaining wall, old hydraulic pit.	18,000	Mar. 22	Works already built.	Apr. 22, 1895	2,130	15,000
114	Railroad Placer.	do	Wm. F. Coe	do	Brush dam	3,000	Mar. 23	Apr. 23, 1895	Sept. 30, 1895	482	1,400
115	Independence	Yuba	John A. Broyles	Yuba	Letsom Ravine	1,800	Mar. 27	....	Mar. 17, 1896	975	500
116	J. C. Day	Eldorado	J. C. Day	American	Brush dam in ravine	1,000	do	Apr. 23, 1895	Mar. 30, 1896	418	500
117	Iowa	Placer	William, Henry, and John Henning.	do	do	1,150	Mar. 29	do	May 13, 1895	1,450	1,500
118	Tiger	do	Jas. Ward and Wm. McDonald.	do	do	7,000	Apr. 1	do	do	1,475	1,000
119	Hard Times *a*.	do	Jos. J. & A. A. Hoffmann and H. McDonald.	do	Brush barriers and old hydraulic pit.	30,000	do	Works already built.	Apr. 22, 1895	1,650	....
120	Eldorado Placer.	Eldorado	Wm. & W. J. S. Bacchi.	do	Brush dam in small stream.	4,000	Apr. 3	do	do	1,209	2,700
121	Zantgraf & Closs. *a*	do	J. Zantgraf and J. J. Closs.	....	Worked-out pit	4,200	Apr. 9	do	Apr. 29, 1895	....	....
122	St. Lawrence *f*	Nevada	Ah Wing	Yuba	Brush dam in Illinois Canyon.	150,000	Apr. 15	July 2, 1895	Oct. 28, 1895	3,900	....
123	Polar Star *g*	Placer	John Spaulding	Bear	Liberty Hill dam in Bear River.	2,000,000	Apr. 17	....	....	....	....
124	Liberty Hill *g*	Nevada	T. G. Phelps	do	do	144,000	Apr. 25	....	....	....	....

a Mine closed.
b Mine abandoned.
c License suspended June 24, 1895.
d Mine worked out.
e Permit refused April 8, 1895.
f Permit canceled April 5, 1897.
g Permit refused May 20, 1895.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1895.			*Cu. yds.*	*Cubic yds.*
125	Lost Camp	Placer	J. B. Rathburn et al	American	Log and brush dam in Woods Ravine	180,000	Apr. 29	Aug. 5, 1895	Dec. 16, 1895	24,600	28,000
126	McFadden *a*	Calaveras	A. J. Mason	Mokelumne	Rock and brush dam in Buckeye Gulch.	240,000	May 27	June 17, 1895			
127	Joubert	Sierra	Frederick Joubert	Yuba	Old pits and dams in Willow Creek.	420,000	June 3	June 15, 1895	July 15, 1895	10,000	240,000
128	Sailor Boy *a*	do	Michael Cortes	do	Dam of Brandy City mine.	20,000	do	Works already built	Aug. 5, 1895		
129	Plumas Imperial.	Plumas	Plumas Imperial Gold Mining Co.	Feather	Rock dam in Rock Creek	120,000	June 11		July 8, 1895	42,500	365,000
130	Horse Valley	Yuba	M. V. Turner, Mrs. F. M. Brown, and Wm. Wellman.	Yuba	Brush dam in Horse Valley Creek.	12,000	do	July 16, 1895	Nov. 8, 1897	240	12,090
131	Youngs Hill	do	Wm. Wellman	do	Brush dams in a dry gulch	5,000	do	do			
132	Atom	do	E. C. Cochran and Charles Turner.	do	Brush dam in Williamson Creek.	70,000	do	do			
133	Galena Hill	do	W. R. & M. J. Williams.	do	Old hydraulic pit at Galena Hill.	84,000	do	July 15, 1895	Nov. 25, 1895	14,975	2,000
134	Tippecanoe	do	George Parent	do	Brush dam in Spanish Ravine.	32,000	do	do	Oct. 28, 1895	17,000	20,000
135	O'Keeffe	do	D. R. O'Keeffe	do	Closing waste cuts in hydraulic pit.	6,000	June 15	July 23, 1895			
136	Charcoal Ranch. *a*	do	L. F. Fourier and John Barrere.	do	Flat adjacent to mine	150,000	do	Works already built	July 23, 1895	813	
137	Sharp	do	E. C. Kendall, J. C. Peterson, and H. Kimball.	do	Brush dam, Sharp Ravine, old pit and reservoir.	200,000	June 24	Aug. 5, 1895			
138	Homestake	do	C. Wichman, W. Elkins, W. R. and B. F. Atkinson.	Feather	Dam, blind ravine	15,000	June 25	July 29, 1895	Sept. 28, 1895	2,800	3,000
139	Corkscrew	Plumas	S. F. Toland and G. W. Langdon.	do	Brush dam, bank of Spanish Ravine.	25,000	June 28	Works already built	Sept. 2, 1895	3,937	5,000
140	Last Chance	do	Henry Goering	do	Log crib dam across outlet of flat basin.	10,000	July 1	do	July 29, 1895	5,300	5,000
141	Chapelain Quartz.	Yuba	James Chapelain	do	Brush dams in dry ravine, emptying into Honcut Creek.	11,245,630	July 3	Oct. 14, 1895			

142	Roomes *a*	Sierra	Luigi Lagomasino	Feather	Brush dam across mouth of pit.	4,600	July 5	Works already built	July 29, 1895		
143	Big Ravine *a*	Nevada	T. T. Kirkham	Yuba	Earth and gravel dam across old reservoir and brush dam on top of this, and other dams.	6,000	July 6	Aug. 5, 1895	Dec. 7, 1896		
144	Brown Placer	Sacramento	Interior Development Co.	Cosumnes	Brush and earth dam, flat ravine.	177,467	...do...	July 29, 1895			
145	Cascade	Plumas	Cascade Water and Mining Co.	Feather	Log dam in Clear Creek	774,400	July 10	Sept. 22, 1895	Dec. 2, 1895		400,000
146	Willow Placer	Sierra	N. B. Willits and B. Pride.	Yuba	Brush and timber dam across sweeping swale.	11,000	July 20	Works already built	Sept. 2, 1895	15,662	5,000
147	Canada	...do...	Oliver F. Caya and W. T. Sherman.	...do...	Log crib dam in French Ravine.	12,000	July 26	Sept. 23, 1895	Nov. 18, 1895	42,500	50,000
148	King Sayre *b*	...do...	W. A. & M. E. Schofield.	...do...	Brush and log dam in Whisky Creek.	18,000	July 31	Works already built	...do...	1,200	8,000
149	Argentine *a*	...do...	Henry H. and A. A. Meyer and John Costa.	...do...	Brush dam in a basin	4,000	Aug. 6	Sept. 23, 1895	Nov. 11, 1895		
150	Eureka Hydraulic. *a*	Eldorado	John Pascoe	American	Brush dams in Chili Ravine.	24,400	Aug. 7	Sept. 12, 1895	Sept. 30, 1895	3,400	
151	Terry Hill *c*	Plumas	E. C. Hard	Feather	Old pit stopped with stone dams.	7,480	Aug. 21	Works already built	Oct. 14, 1895	7,386	6,000
152	Gravel Hill	Eldorado	E. D. Simpson, Gerhard Tebble, and J. A. Hunt.	American	Log dams, Gravel Hill Canyon, and natural barrier, Jones Hill Canyon.	387,000	Aug. 31				
153	Lone Star Placer.	Plumas	Will De Vinny	Feather	Gravel dam and log dam, Jackson Creek.	18,488	...do...	Works already built	Oct. 14, 1895	36,900	15,000
154	Poorman's Hydraulic.	Eldorado	Chas. Jordan	American	2 brush dams, Taylors Ravine.	3,023	Sept. 22	Oct. 15, 1895	Dec. 16, 1895	2,440	2,800
155	Eagle Mining Claim. *a*	Amador	Lorenzo Canata and Giacomo Oneto.	Mokelumne	Brush dam in Dry Creek	10,300	...do...	Works already built	Nov. 4, 1895		
156	Jackson Creek Placer.	Plumas	Mrs. Bertha Sutton	Feather	Old pits and dams in Jackson Creek.	32,000	Sept. 28	Nov. 19, 1895	Feb. 23, 1897	7,900	5,000
157	Bobby Burns Hydraulic. *a*	Eldorado	Henry Niedecker and Geo. Alderson.	American	Brush dam, Johnson Creek.	40,333	Oct. 1	Works already built	Nov. 18, 1895		
158	Dutch *d*	Plumas	Simcoe Chapman	Yuba	Log crib dam in Rabbit Creek and old pit.	12,000	Oct. 3	...do...	...do...	41,700	50,000
159	Lewis	...do...	Fred Lewis	Feather	Dams in old pit and Rich Gulch.	1,000	Oct. 4	...do...	...do...	1,050	500
160	Martin Hydraulic. *a*	Eldorado	C. W. & W. W. Martin	American	Dam, White Rock Canyon.	38,720	...do...	...do...	...do...	3,000	
161	Miocene *a*	Plumas	Chas. Y. Hepler	Feather	Dams, Schneider Gulch, and old pit.	6,000	Oct. 8	Nov. 19, 1895	Dec. 30, 1895		
162	Arctic	...do...	Fred Scott	...do...	Dam, Marian Creek	18,000	...do...	...do...	Oct. 26, 1896	4,000	2,000
163	Tiedeman *a*	Eldorado	Henry E. Picket	American	Brush dam in Marshall Canyon.	129,055	Oct. 11	Works already built	Nov. 18, 1895		

a Mine closed.
b Now operated by Garnett Gold Mining Co.
c Now operated by W. E. Duncan, sr.
d Now operated by La Porte Consolidated Gold Mining Co.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1895.			*Cu. yds.*	*Cubic yds.*
164	Chaparral Hill Gold Gravel.	Plumas	Ed. & Jas. Bryan and Aug. Fisk.	Feather	Brush and rock dam in dry ravine.	28,233	Oct. 12	Nov. 19, 1895	Dec. 16, 1895	11,236	20,000
165	Blacklock	Eldorado	Eugene Piaggi	American	Dams in Taylor and another ravine.	413,000	Oct. 19	Works already built	Nov. 18, 1895	3,780	31,220
166	Pacific[a]	Sierra	Daniel Conlan	Yuba	Old pits; cuts stopped with dams.	4,629	...do	...do	...do	....	....
167	Plumas Blue Gravel.	Plumas	Plumas Blue Gravel Mining Co.	Feather	Old hydraulic pits	44,444	...do	Nov. 19, 1895	Dec. 30, 1895	760	500
168	Reese	Shasta	George Reese	Sacramento	Brush dam in a dry ravine.	500,133	Oct. 21	Nov. 26, 1895	Jan. 6, 1896	1,000	1,000
169	Ram Creek Placer.	Butte	J. M. McClung	Feather	....	....	...do	....	....	....	....
170	Consolidated Sailor Creek Placer.	Eldorado	Geo. W. Davey	American	Log, brush, and rock dam in Irish Creek.	14,520	Oct. 25	Works already built	Nov. 18, 1895	2,304	500
171	Michigan Hill.	Plumas	John Higgins	Feather	2 old pits stopped with brush dams, and log dam on flat ground.	15,000	Oct. 29	Nov. 19, 1895	Dec. 2, 1895	3,620	3,000
172	Manzanita[b]	Nevada	Kate Hayes Mining Co.	Yuba	Gravel and brush dams in Sweetland Creek.	1,159,604	Sept. 23	Oct. 7, 1895	Oct. 28, 1895	184,900	....
173	Farrel	...do	Eureka Lake and Yuba Canal Co.	...do	Earth dam in worked-out pit.	111,000	Oct. 28	Works already built	Nov. 18, 1895	59,573	160,000
174	Forest Home	Amador	W. A. Roberts and John Graham.	Cosumnes	Earth and stone dam, Arkansas Creek.	1,420,000	Nov. 2	...do	Dec. 23, 1895	93,000	90,000
175	Bull Neck Gravel.	...do	James F. Ish	San Joaquin	Log and brush dam in blind ravine.	200,000	Nov. 8	Dec. 24, 1895	....	....	....
176	Cole	Eldorado	W. H. Cole	Cosumnes	Brush dam in a dry gulch.	12,000	Nov. 16	Works already built	Dec. 23, 1895	240	13,000
177	Mill Gulch Gravel.	Amador	Henry M. and H. N., jr., Dickerman and John Dynam.	...do	...do	900	Nov. 19	Dec. 24, 1895	Mar. 30, 1896	....	....
178	Jay Bird	Yuba	John G. Ramm	Yuba	Rock dam	12,100	Nov. 23	...do	Jan. 20, 1896	3,450	800
179	Wild Yankee.	Placer	Wm. Schilliansky, C. A. Oakes, R. W. Walter, and S. L. McKim.	American	Timber dam	100,000	Nov. 25	Dec. 16, 1895	Dec. 21, 1895	5,150	600
180	Badger Hill[c]	Plumas	A. B. Jacks and John Gifford.	Feather	Dam, Woods Ravine and closed cuts.	15,000	Nov. 27	Dec. 23, 1895	Jan. 13, 1896	2,935	....

181	Pine Leaf	....do	John Schafer	....do	Brush dam, worked-out pits.	4,000	Nov. 29	Works already built	Dec. 23, 1895	600	500
182	Quaker Hills	Nevada	Geo. C. Sargeant	Yuba	Dams on flat ground, Deer Creek.	70,000	Nov. 30	....do	Dec. 30, 1895	....	....
183	Meehan Placer. *a*	Amador	Jas. Meehan	Mokelumne	Brush dam	217,800	Dec. 3	Dec. 24, 1895	Mar. 30, 1896	997	....
184	Trafton	Placer	J. N. Findley	American	....do	4,000	....do	Dec. 16, 1895	....do	82	4,000
185	Irish Hill *a*	Amador	G. W. Smith	Mokelumne	Brush dam in a dry gulch.	322,607	Dec. 5	Works already built	Dec. 23, 1895	....	....
186	Kerr	Placer	Jos. G. De Bons	American	Brush barriers, Devils Canyon.	2,000	Dec. 6	Jan. 13, 1896	Mar. 30, 1896	60	2,140
187	Clay Bank *a*	Plumas	Henry A. Hallsted	Feather	Log and brush barriers in flat swale.	6,500	Dec. 14	Works already built	Jan. 13, 1896	2,500	....
188	Sherwood and Snyder.	Tuolumne	L. M. Sherwood, W. H. Snyder, and O. E. E. Ryley.	Tuolumne	Worked-out bed of Moccasin Creek.	75,000	....do	No works necessary.	....do	....	....
189	Blue Gravel Placer.	Amador	W. H. Glenn and J. H. Hayden	Mokelumne	Brush dam in Rancheria Creek.	10,000	Dec. 23	Works already built	Jan. 13, 1896	7,256	5,000
190	Emma Harding. *a*	Plumas	J. F. Evans	Feather	No works necessary	2,500	....do	....	....do	....	....
191	Roman *a*	....do	John Smith	....do	....do	....	....do	....	....do	....	....
192	Kendall *a*	Eldorado	Wiley Sexton	Cosumnes	Dogtown Creek	100	Dec. 26	Sept. 21, 1896	Dec. 21, 1896	....	....
193	Polar Star *d*	Placer	John Spaulding	Feather	Bear River	2,000,000	Dec. 31 1896.	June 6, 1896	Mar. 14, 1898	60,200	500,000
194	Liberty Hill *d*	Nevada	T. G. Phelps	....do	....do	144,000	Jan. 2	....do	Feb. 7, 1898	8,200	
195	Adkins *a*	Shasta	Olonzo Engle	Sacramento	Brush dams in a gulch	161,334	....do	Works already built	Jan. 20, 1896	....	....
196	Quong Yuck *e*	Nevada	On Sackee and Ah You.	Yuba	Log dam in Humbug Creek.	75,000	Jan. 4	....	....	....	....
197	Kanaka Flat	Plumas	William Wampler and Solon P. Jacks.	Feather	Log dams in ravine and Spanish Ravine.	6,000	Jan. 7	....	Jan. 20, 1896	722	800
198	Coney	Shasta	G. M. Coney and W. S. Adkins.	Sacramento	Brush dams	150,000	Jan. 10	....	Mar. 17, 1896	8,205	3,000
199	Gorman	Placer	H. L. Van Eman	American	Log and brush dams in Skunk Gulch.	160,000	Jan. 13	Mar. 18, 1896	Mar. 30, 1896	....	*e* ....
200	Princess	Shasta	O. H. Simons	Sacramento	Crib dam in dry gulch	4,114,000	Jan. 16	....do	....do	21,200	14,700
201	Goyan	Eldorado	Frank Goyan	American	Brush dam in Fish Canyon	3,484,800	Jan. 7	Jan. 20, 1896	....	....	....
202	Nigger Ranch	....do	Giacomo Gianini and J. L. Poggi.	Cosumnes	Log dam	3,000	Jan. 22	Feb. 10, 1896	Dec. 21, 1896	195	3,805
203	Proper	Calaveras	John Sybel	Stanislaus	No works necessary	14,000	....do	....	Mar. 17, 1896	1,700	400
204	No Chunk	Placer	E. S. Thompson and G. E. Hill.	American	Log dam in Skunk Gulch	....	....do	Mar. 18, 1896	Mar. 30, 1896	500	600
205	Kanaka Valley.	Eldorado	A. J. McDonald	....do	Brush and rock dam	900	Jan. 28	Sept. 21, 1896	Jan. 3, 1898	....	3,000
206	Empire Hill	Yuba	Paris Bean	Yuba	Board and log dam	1,700	Feb. 3	....	....	....	....
207	Badger Hill	Eldorado	John J. Bailey	American	Pine tree dam	52,266	Feb. 17	....	....	....	....
208	Dark Ravine	Plumas	Mrs. Amalie Hafner	Feather	Log and brush dams in Dark Ravine.	1,000	Feb. 20	Oct. 27, 1896	Jan. 7, 1897	....	....

a Mine closed.
b Permit canceled January 19, 1897.
c Permit canceled February 14, 1898.
d Impounding works in common.
e Mine will not be worked.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1896.			*Cu. yds.*	*Cubic yds.*
209	Grasshopper Hydraulic.	Eldorado	B. Guidici	Cosumnes	Two brush dams	20,000	Feb. 20	Apr. 20, 1896	....	....	....
210	Miners' Row	Placer	E. D. Hurd	American	Brush and log dams	48,400	Feb. 24	Apr. 6, 1896	....	....	....
211	Nellie Bly	Shasta	Alfred A. Ludwig and Wm. Everest.	Sacramento	Log and brush dam	6,453	Mar. 17	Works already built	Apr. 6, 1896	140	1,200
212	Duquesne Placer.	Plumas	R. R. Gumbert	Feather	Log and brush dam in dry ravine.	3,000	Mar. 19	Oct. 27, 1896	....	....	....
213	Try Again Hydraulic.*a*	Eldorado	Giacomo Varozza	American	Brush dam	4,500	Mar. 23	July 13, 1896	July 20, 1896	....	....
214	Ellen Taylor	do	Cy Mulkey	Cosumnes	Log and brush dam	1,209,967	Apr. 4	Works already built	July 27, 1896	1,000	1,500,000
215	Phillips Claim	Placer	W. Phillips	American	Three brush dams	5,000	Apr. 7	July 20, 1896	Aug. 17, 1896	390	400
216	Cook Gravel	Tuolumne	F. W. Eaton	Tuolumne	Log and brush dam	900,000	Apr. 14	July 27, 1896	....	....	....
217	Raffetto Placer	Eldorado	Giovanni Raffetto	American	Brush and timber dams	67,000	Apr. 16	Works already built	July 20, 1896	4,080	5,000
218	Park & Browne Claim.	Placer	Bernard Cavanaugh	do	Two log dams in a dry ravine.	38,720	May 13	Aug. 18, 1896	....	....	....
219	Deer Creek *b*	Nevada	Eber A. Sanford	Yuba	No works necessary	48,400	May 18	....	Nov. 2, 1896	....	....
220	Slate Creek Placer. *c*	Plumas	Henry W. Orr	Feather	Two log and brush dams	4,000	June 3	....	....	....	....
221	Buckeye Hill Placer.	Eldorado	John J. Flora	American	Dam in Buckeye Canyon and flat ground.	2,000,000	June 6	Nov. 6, 1896	Apr. 26, 1897	50,000	20,000
222	California Gold Mining and Investment Co.'s Claim.	Plumas	California Gold Mining and Investment Co.	Feather	Brush dam, Foreman Canyon.	30,000	June 8	....	Oct. 26, 1896	....	....
223	Shirley Mining Co.	Placer	Shirley Mining Co	American	Two brush dams	3,780,000	June 15	Aug. 18, 1896	Jan. 11, 1897	7,500	3,000
224	Maylone Gravel.	Eldorado	J. R. Vandergrift	Cosumnes	Log and brush dam	....	June 25	Sept. 21, 1896	June 2, 1897	42,000	10,000
225	Jack's Ranch Placer.	Plumas	Walter Shackelford	Feather	do	....	July 20	Works already built	Nov. 2, 1896	....	....
226	Sacket's Gulch Claim.	Sierra	J. F. Cowdery	Yuba	Three log crib dams	27,000	July 25	do	Nov. 16, 1896	7,440	1,243
227	Marlow	Tuolumne	A. P. Scheld	Tuolumne	Brush and rock dam	4,000,000	May 1	July 27, 1896	July 27, 1896	7,800	8,000
228	Last Chance	Plumas	Fred C. De Chaine	Feather	No impounding works necessary.	90,000	June 11	....	Oct. 26, 1886	....	....

229	Barnhardt	Calaveras	Cademartori & Pelrano	Calaveras	Brush and rock dam	4,856,000	Aug. 5	Aug. 31, 1896	Mar. 1, 1897	10,000	60,000
230	Beattie & Parsons. *d*	Eldorado	Geo. Beattie	American			Aug. 7				
231	Hilda	Sierra	Richard Phelan	North Yuba	Log and brush dam		Aug. 18	Oct. 27, 1896	Nov. 8, 1897	3,500	5,000
232	Alcyone	Calaveras	W. A. Keefer	Calaveras	Dam in San Domingo Creek.		Aug. 21	Sept. 15, 1896	Jan. 4, 1897	8,000	10,000
233	French Claim	Eldorado	J. R. Sears	Middle Cosumnes.	Log and brush dam	250,000	Aug. 25	Sept. 22, 1896	Dec. 21, 1896		
234	Larsen Placer	do	Emil E. Larsen and John H. Harris.	American	Log dam	11,666	Aug. 28	Oct. 13, 1896	Jan. 19, 1897	4,500	13,000
235	Miocene	Plumas	W. H. Leek	North Feather	Dam in Rush Creek	12,100	Aug. 31	Works already built	Oct. 26, 1896	14,000	6,000
236	Cascajo	Calaveras	Hugh Craig	Middle Mokelumne.	Brush dam	3,872,000	Sept. 3	Oct. 13, 1896			
237	Mad Mule	Shasta	John Faubel	Sacramento	Log and brush dam	200,000	do	Sept. 28, 1896	Nov. 30, 1896		
238	Blue Eyes	Placer	A. F. Sheehan	Middle American.	Log dam		Sept. 11	Nov. 23, 1896			
239	Bell & Dorsey	Eldorado	Plymouth Consolidated Gold Mining Co.	Cosumnes	Log and brush dam		Sept. 16	do	May 22, 1899		
240	Gold Run	Placer	E. A. Wiltsee	North American.	Log crib dam	311,000	Sept. 21	Oct. 13, 1896	Nov. 23, 1896	250,000	150,000
241	Craycroft	Sierra	H. Spaulding and others.	Yuba	do	90,000	Sept. 24	Oct. 27, 1896			
242	Clark & Willis. *e*	Calaveras	F. B. Clark	Mokelumne	Log and brush dam	60,000	Sept. 28	Nov. 17, 1896	Jan. 23, 1899	5,550	8,000
243	Albright Placer. *f*	Eldorado	W. H. Albright	American	do	4,833	Sept. 30	Works already built	Nov. 9, 1896	1,120	2,000
244	Wild Cat	Nevada	Geo. W. Jones	South Yuba	Brush dam in Blind Shady Creek.	20,000	do	do	Nov. 2, 1896	7,586	3,000
245	Burlington	Sierra	John Freeman	North Yuba	Log and brush dam	20,000	Oct. 2	do	Oct. 26, 1896	5,000	3,500
246	Little Bowlder Creek.	Plumas	Isaac Blomquist	Middle Feather.	do	6,000	Oct. 7	do	do	3,000	1,000
247	Eckman & Moulton. *g*	Nevada	W. E. Moulton and D. W. Eckman.	South Yuba	Gravel and brush dam	177,000	Oct. 9	Nov. 2, 1896	Jan. 25, 1897	95,000	100,000
248	Hall & French	*g* do	Thos. Hall and Chas. D. French.	do	do	208,000	do	do	do	92,000	
249	Linda Placer	Sierra	David Corbett	North Yuba	Two dams on flat	12,500	do	Works already built	Nov. 16, 1896	1,100	4,000
250	Divide	Eldorado	Jas. E. Roelke	South American.	Brush and rock dam	6,600	Sept. 14	do	Nov. 9, 1896	4	2,000
251	Campi Placer	Amador	Eckhart & Solario	Mokelumne	Log and brush dam	9,000	Sept. 17	do	Dec. 28, 1896	4,000	3,500
252	Blackwater Claim.	Plumas	W. Konradi	Feather	Works of Gopher Hill Mine in Waupansie Creek.	30,000	Oct. 20	do	Nov. 16, 1896	7,607	10,000
253	Santa Clara	Amador	Em. Santirfo	Mokelumne	Log and brush dam		Oct. 21	do	Dec. 28, 1896	672	1,000
254	Cleveland Placer.	Plumas	Pitro Picolo and Luigi Sobrero.	Middle Feather.	do	30,000	do	do	Nov. 16, 1896	600	1,000

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a See supplemental application No. 355.
b Mine closed.
c Will not be worked. No impounding facilities exist.
d See supplemental application, No. 384.
e Now operated by A. L. Taylor and W. V. Clark.
f Permit canceled March 7, 1898.
g Impounding works in common.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1896.			*Cu. yds.*	*Cubic yds.*
255	Lady Edner	Eldorado	Chas. Edner	Middle Cosumnes.	Brush dam	1,873	Oct. 24	Nov. 9, 1896	Dec. 21, 1896	2,300	6,000
256	Grub Flat No. 2. *a*	Plumas	Walter Shackleford	North Feather	Log and brush dam	25,000	Oct. 26	Works already built	Nov. 16, 1896	4,600	3,700
257	Sebastopol Flat.	....do	Francis Jackson	....do	Rock and brush dam	6,000	....do	....do	....do	424	700
258	Preacher's Ravine.	Sierra	Lamont Brown	Yuba	Log and brush dam	11,111	Oct. 22	Nov. 16, 1896	Jan. 15, 1897	2,400	5,000
259	Crawford Diggings.	Yuba	J. H. Nickleson and T. J. Williams.	North Yuba	....do	20,000	Nov. 7	Works already built	Dec. 7, 1896	1,000	2,000
260	Forty-nine	Butte	Oregon Gold Mining Co.	South Feather	Brush dam	....	....do	Dec. 7, 1896	Jan. 19, 1897	200	1,300
261	Bald Mountain.	Eldorado	Edgar Maylone	Cosumnes	Log and brush dam	2,772	....do	Works already built	Dec. 21, 1896	15,180	10,000
262	Gilbert	Placer	Hoffman & McDonald.	North American.	....do	6,200	Nov. 9	....do	Dec. 7, 1896	....	....
263	Buckeye Hill	Nevada	Geo. W. Jones	Feather	....do	16,000	Nov. 24	Dec. 7, 1896	Jan. 25, 1897	372	....
264	North Star *b*	Eldorado	C. W. & W. W. Martin	South American.	Brush dam	....	Nov. 28	Works already built	Dec. 21, 1896	16,800	....
265	Bowlder Hill	....do	Stevens, McKinney & Co.	....do	Brush and rock dam	....	Nov. 30	....do	....do	870	1,400
266	Hayden Hill *c*.	Placer	Ah Sing	North American.	Rock dam	....	....do	Dec. 21, 1896	Dec. 28, 1896	16,600	8,000
267	Union *d*	Yuba	C. C. Beever	Yuba	Brush dam in dry ravine	....	Dec. 4	Jan. 5, 1897	....	92	1,000
268	Golden Gate	Plumas	W. H. Trescott	Feather	Log crib dam	....	Dec. 5	Works already built	Nov. 29, 1897	....	....
269	Saxton	....do	Dr. C. P. Saxton	....do	No impounding works necessary.	....	....do	....	Jan. 4, 1897	....	....
270	Sailor Flat	Nevada	O. D. Campbell	South Yuba	Log and brush dam	25,000	Dec. 7	Works already built	Apr. 3, 1899	5,750	8,000
271	Blue Tent	....do	W. H. DeMott	....do	....do	60,000	....do	....do	Jan. 25, 1897	17,777	5,000
272	Frank Milan	Yuba	Mathias Diehl	North Yuba	Rock and brush dam	....	....do	Jan. 5, 1897	Feb. 8, 1897	650	500
273	Montre	Sierra	R. M. Cunningham and Thomas Phillips.	Yuba	Brush dam in Grizzly Canyon.	....	Dec. 12	Works already built	Jan. 25, 1897	3,000	2,000
274	Bell Quartz *e*	Plumas	Frank E. Thomas	North Feather	Log and brush dam	....	Dec. 14	....	....	....	....
275	Cedar Creek Consolidated	Eldorado	Cy Mulkey	Cosumnes	....do	....	Dec. 16	Jan. 5, 1897	....	....	....

276	Lucot	Amador	Samuel D. Robinson and Al. Petty.	do	do		Dec. 28	Works already built	Jan. 4, 1897	2,000	1,000
277	Drummondsville.	do	S. J. Holsinger	do	Brush dam		1897. Jan. 5	Jan. 25, 1897	Mar. 22, 1897	3,400	1,000
278	Pebble Bottom	Placer	G. D. Duncan & Co.	North American.	Log and brush dam	83,333	Jan. 7	do	Feb. 8, 1897	350	5,000
279	Woodpecker Placer.	Butte	D. Edgmon	South Feather	Brush dam	15,000	Jan. 8	Works already built	Feb. 1, 1897	2,045	1,000
280	Big Chunk	Eldorado	John C. Murphy	South American.	Log and brush dam	2,420	Jan. 9	do	Feb. 1, 1897	590	1,000
281	Hawkeye	Amador	Henry Whitehead & Co	Mokelumne	Brush dam	17,000	Jan. 20	do	do	840	5,000
282	Irish Hill	do	Geo. W. Hadley	Cosumnes	do		Jan. 18	do	do	1,150	2,000
283	Frazer Placer[b]	Calaveras	J. B. Leonardini	Calaveras	Brush dam in Old Gulch		Jan. 28	Feb. 15, 1897	Mar. 1, 1897	702	
284	Zugar & Lewis.[b]	do	J. W. Zugar	do	do		do	do	do	2,608	
285	High Point	Yuba	Thos. Mullin	Middle Yuba	Log and brush dam		do	do			
286	Kentucky Hill	Sierra	Chas. Weiss	do	do		do	do	Mar. 29, 1897	1,000	800
287	Roberts & Co.	Yuba	A. F. Roberts	Yuba	Rock and earth dam	1,700	Feb. 1	Works already built	Feb. 15, 1897	550	
288	Sugar Loaf	Placer	Ed. Gray and John Taylor.	South Yuba	Two brush dams		Feb. 2	do	do	985	1,000
289	Smith's Flat	Plumas	Wampler & Jacks	Feather	Log and brush dam	5,000	Feb. 10	Aug. 24, 1897			
290	Sunny South	Eldorado	E. Williamson & Co.	Middle Cosumnes.	do	150,000	Feb. 17	Works already built	Mar. 8, 1897	7,628	5,000
291	Jones & Humphreys[f]	Yuba	Dave Humphreys and R. R. Jones.	North Yuba	do		Feb. 19				
292	Hall's Flat	Butte	B. P. Crandall	North Feather	Two old pits below mine		Feb. 12	Feb. 23, 1897	Mar. 1, 1897	396	1,000
293	Annie Laurie	Placer	Geo. Nissen	North American.	Brush and rock dam	15,000	Mar. 9	Mar. 29, 1897	Jan. 24, 1898	209	3,000
294	Alameda	do	Frank Wise and Martin Partridge.	do	do	50,000	do	Works already built	Mar. 29, 1897	3,750	1,000
295	Philadelphia	Tuolumne	T. C. Cox and A. C. Pidge.	Stanislaus	Log and brush dam	31,600,000	Mar. 13	Aug. 2, 1897			
296	Little Grass Valley.	Nevada	F. G. Curnow et al.	Yuba	Rock and brush dam	3,000	Mar. 29	Works already built	Apr. 19, 1897		3,000
297	Galena Hill[g]	Yuba	Morris J. Williams et al.	do	Brush dams	3,000	Apr. 6	do	May 3, 1897	625	
298	Hustler No. 2[h]	Nevada	Jos. Hostler	do	do	9,000	Apr. 12				
299	Howlett	do	Chas. and Ben Howlett	do	Log and brush dam	10,000	Apr. 19	May 10, 1897	Jan. 24, 1898		4,000
300	Marguerite[i]	do	Marguerite Gravel and Quartz Mining Co.	do	do	15,000	Apr. 21				
301	McGregor & Nix.[j]	Butte	Wm. McGregor and C. F. Nix.	Sacramento	Impounding works of Spring Valley Mine.		Apr. 23				
302	Industrial	Eldorado	Industrial Gold Mining Co.	Cosumnes	Log and brush dam	1,500	May 8	Works already built	May 24, 1897	500	1,500
303	Messerer[k]	Plumas	James Rooks	Feather	do	1,000	May 5	Aug. 23, 1897	Oct. 25, 1897	100	1,000

[a] Now operated by Henry A. Hallsted.
[b] Mine closed.
[c] Permit suspended from December 27, 1897, to February 8, 1898.
[d] Working under permit of November 27, 1894.
[e] Will not be worked.
[f] Mine abandoned.
[g] Supplemental application.
[h] Authorization of proposed impounding works refused May 3, 1897.
[i] Permit refused July 26, 1897.
[j] Permit refused.
[k] Now operated by McElroy & Gordon.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1897.			*Cu. yds.*	*Cubic yds.*
304	Costa & Davis Mining Co.	Butte	John Costa and Frank Davis.	....	Worked-out pit	10,000	May 8	May 24, 1897	Oct. 25, 1897	1,550	1,200
305	Haskel Ravine.	Sierra	Haskel Ravine Mining Co.	Feather	Log and brush dam	14,000	May 11	July 26, 1897	....	....	....
306	Parsons	Eldorado	Hoey & Lewis	Cosumnes	do	200,000	May 22	June 14, 1897	Oct. 11, 1897	4,200	2,000
307	Morristown	Sierra	Daniel McLaughlin	Yuba	do	10,000	May 24	July 26, 1897	....	....	....
308	Etta	do	Henry Northrop and Robert C. Nicholson.	do	Log and rock dam	444	May 26	do	....	....	....
309	May Flower	Placer	May Flower Gravel Mining Co.	American	Log crib dam	4,000,000	May 28	Sept. 14, 1897	Jan. 24, 1898	2,593	10,000
310	Pactolian[a]	Plumas	Dr. J. P. Welch	Feather	Brush dam	64,500	June 1			....	....
311	Mountain View.	Butte	J. P. West	do	do	....	May 26	June 28, 1897	Feb. 20, 1899	1,400	5,000
312	Gold Bug	Eldorado	Gold Bug Mining Co.	American	Brush and log dams	635,550	July 1	Aug. 9, 1897	Dec. 20, 1897	7,300	10,000
313	Eclipse & Boston.	Plumas	E. D. Bowman et al	Feather	Log crib dam	....	July 10	Aug. 24, 1897	Nov. 29, 1897	4,200	20,000
314	King Bird	Yuba	E. H. Adams	do	Log and brush dam	7,000	July 21	Sept. 13, 1897	Feb. 28, 1898	....	....
315	Fratus & Foster.	Butte	John Fratus and Manuel Foster.	Sacramento	....	....	July 28	....	....	....	....
316	Lost Camp	Placer	J. T. Coffman and G. T. Miller.	American	Log and brush dam	400,000	Aug. 13	Works already built	Sept. 13, 1897	3,400	5,000
317	Washington	Sierra	Mrs. E. A. Cox	Feather	Log dam	80,000	Aug. 20	Sept. 13, 1897	Feb. 28, 1898	9,650	10,000
318	Willow Pl. Extension.	do	N. B. Willits et al	Yuba	do	25,000	Sept. 1	Works already built	Jan. 3, 1898	7,200	2,000
319	California	do	G. A. Rosenthal, Jas. Cosgrove, and Wm. Costigan.	North Yuba	do	8,000	Sept. 7	do	Nov. 8, 1897	200	1,000
320	Hallsted Placer.	Plumas	H. A. Hallsted	Feather	do	20,000	Sept. 8	do	Nov. 29, 1897	1,500	1,000
321	Schneider Diggings.	do	Jacob Yager	American	do	20,000	do	do	Oct. 25, 1897	....	5,000
322	Taber Gold	Sierra	Horace Taber	Yuba	do	10,000	Sept. 10	do	do	1,890	1,800
323	Black Oak	Placer	Fred Smith	American	Log and brush dam	10,740	Sept. 14	Oct. 19, 1897	Jan. 24, 1898	....	3,000
324	Miocene	Plumas	W. H. Leek et al	Feather	do	50,000	Sept. 15	Works already built	Nov. 15, 1897	5,650	15,000
325	Ellrig	Amador	Henry Coubrough	Cosumnes	No works necessary	193,600	Sept. 16	Nov. 2, 1897	Dec. 20, 1897	2,080	3,400
326	Slate Creek	Eldorado	John C. Murphy	American	Log and brush dam	4,840	do	Oct. 11, 1897	do	....	5,000

327	Jamison Pl	Plumas	John M. Jackson	Feather	Log dam	15,000	....do	Works already built	Dec. 27, 1897	570	1,000
328	Barnard's Diggings.	....do	Sook Hung Lung	Yuba	Log crib dam	10,000	Sept. 20				
329	Jupiter Gravel. b	Calaveras	Jupiter Gravel Mining & Water Co.	Calaveras	Log and brush dam	50,000,000	Sept. 24	Nov. 2, 1897	Jan. 17, 1898	80,000	75,000
330	Spanish Bar c	....do	Howard Rule	Mokelumne			Sept. 29				
331	Grizzly Canon	Sierra	Victor Montre	Yuba	Brush dam		....do	Nov. 8, 1897	Jan. 24, 1898	770	1,200
332	Homestake No. 2.	....do	B. F. Atkinson et al	Feather	....do	25,000	....do	Works already built	Oct. 11, 1897		4,000
333	Emerton	....do	Sam Ahtye	North Yuba	Log dam	5,000	....do	....do			
334	Doherty d	....do	....do	....do	....do	16,600	....do	Oct. 26, 1897			
335	Gold Nugget	....do	C. R. Scott et al	....do	....do	15,000	Oct. 1	Works already built	Nov. 29, 1897	1,120	2,000
336	Sackets Gulch	....do	J. F. Cowdery	Yuba	Brush dam	25,000	Oct. 6	....do	Nov. 15, 1897	2,700	5,000
337	Canada	....do	W. T. Sherman and O. F. Caya.	North Yuba	Log crib dam	4,000	Oct. 15	....do	Nov. 29, 1897		5,000
338	Mosquito	Yuba	R. Cordez	Yuba	Brush dam		Oct. 19	Nov. 8, 1897	Jan. 24, 1898	75	1,000
339	Montalgo	Eldorado	C. N. Foote	Cosumnes	Stone dam	1,750	Oct. 21	Works already built	Jan. 17, 1898		1,000
340	Richardson Ranch.	Shasta	Santa Clara Mining Co.	Sacramento	Irrigating dam		Oct. 11	....do	Nov. 8, 1897		10,000
341	Conrad & Wheeler.	Butte	T. Larimore	Feather	Log and brush dam	10 740	Oct. 26	....do	Nov. 29, 1897	400	2,000
342	Manuel Silva Mining Co.	....do	Manuel Silva and J. Enos.		Brush dam		Nov. 8				
343	Mohler	Sierra	Geo. W. Mohler	Yuba	Log and brush dam		Nov. 11	Nov. 29, 1897	Jan. 24, 1898	5,400	3,000
344	Round Butte	Calaveras	E. C. Rigney		....do	600,000	Oct. 26	Nov. 8, 1897	Dec. 20, 1897	14,250	8,000
345	Cambridge	Amador	D. D. Allard et al	Cosumnes	....do	160,000	Nov. 11	Dec. 20, 1897	Jan. 17, 1898	1,500	2,000
346	Manzanita	Nevada	Kate Hayes Mining Co.	Yuba	Impounding basin of Manzanita Mine.		Nov. 1	Jan. 10, 1898	Mar. 28, 1898	55,350	20,000
347	Colfax Gravel and Pierce.	Placer	J. H. Kneeland, jr	American	Log and brush dam		Nov. 8	Works already built	Feb. 7, 1898	700	5,000
348	American Gravel. e	Butte	L. L. Sherrod et als	Sacramento	Brush dams		....do	Dec. 20, 1897	....do	3,025	3,000
349	Sunshine	Sierra	Thos. Wayman	Yuba	Log crib dam	10,000	Nov. 18	....do	Jan. 24, 1898	1,816	1,000
350	Grizzly	....do	Geo. Standart	....do	Brush dam	5 000	....do	Works already built	....do	110	1,000
351	Red Dog	Nevada	John Spaulding	Bear	Log crib dam		Nov. 22	Jan. 10, 1898	Feb. 21, 1898	44,200	20,000
352	Red Hill	Placer	A. A. Pond	American	Log and rock dam		Nov. 24	Works already built	Jan. 3, 1898	3,875	2,000
353	Ralph Farnham Gravel.	Eldorado	Ralph Farnham	Cosumnes	Log and brush dam		....do	....do	Dec. 20, 1897	1,900	1,500
354	Badger Hill	....do	Geo. Rieber	American	....do		Nov. 26	....do	Dec. 27, 1897		800
355	Try Again Placer.	....do	F. W. Cook	....do	....do	180,000	Nov. 28	....do	Jan. 3, 1898	25,000	10,000
356	Hoosier	....do	Matt Yoner	....do	Dam on Bear Creek	1,500	Dec. 1	....do	Jan. 31, 1898		2,000
357	Mountain Ranch.	Calaveras	Otto Reichel	Calaveras	Rock dam		....do	....do	Feb. 14, 1898		10,000

a Mine abandoned.
b Now operated by San Domingo Gold Mining Co.
c Permit refused October 11, 1897.
d See supplemental application, No. 419.
e Now operated by S. Pomeroy and J. Wyllie.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1897.			*Cu. yds.*	*Cubic yds.*
358	Johnston Placer.	Calaveras	W. H. Johnston et al.	Calaveras	Log crib dam		Dec. 2	Dec. 27, 1897			
359	McMartin	Plumas	W. C. Corbett and A. W. Carmichael.	Feather	Impounding works of Good Hope Mine	50,000	Nov. 25	Works already built	Nov. 29, 1897	2,900	12,000
360	Chris Limpher	Amador	W. N. Lamb and J. G. Underwood.		Brush dam	96,000	Dec. 6	Dec. 27, 1897	Jan. 17, 1898	700	3,000
361	Frazzer & Swank.	Calaveras	B. Freccero	Calaveras	Stone dam		Dec. 11	Jan. 17, 1898	Mar. 28, 1898	260	2,000
362	Cherokee Flat	Butte	Manuel Silva and J. Enos.		Brush dam		Dec. 13				
363	Grizzly Bear	Plumas	J. Lagomasino	Feather	Log and brush dam	7,000	Dec. 15	Works already built	Jan. 17, 1898	665	2,000
364	Last Chance	Sierra	Paul Zerga et al	Yuba		29,000	Dec. 17	Nov. 29, 1898			
365	Mount Vernon	Nevada	T. T. Kirkham	do	Rock dam	4,000	Dec. 20	Works already built	Jan. 24, 1898	1,320	3,400
366	Clark	Amador	Wm. Ross		Rock and brush dam	10,000	Dec. 21				
367	White Oak	Placer	Chas. E. Wise	American	Brush dam	8,000	do	Works already built	Jan. 24, 1898	2,098	1,000
368	Red Gulch and Mahala Flat Hill.	Amador	John Solari and Joe Devencenzi.	Mokelumne	do	11,000	Dec. 22	do	Jan. 17, 1898	78	6,980
369	Bicknell	do	J. F. and M. A. Goodman.	do	do		do	do	do	266	11,700
370	Indiana and Gold Bug.	Eldorado	S. R. Hackley	Cosumnes	Log and brush dam	100,000	Dec. 23	do	Jan. 31, 1898	880	3,000
371	Murphy Diggings.	Amador	O. M. Henry	Mokelumne	Log dam	5,900	1898. Jan. 5	do	Feb. 7, 1898	550	6,000
372	Clap Board Gulch.	do	Geo. A. Gritton	do	do	1,112	Jan. 6	do	do		
373	Cox	Eldorado	Frank J. Goyan	American	Log and brush dam		Jan. 11	do	Oct. 10, 1898	2,661	3,000
374	Hull Placer	Plumas	J. M. Longnecker	do	Log dam	50,000	Jan. 13	Mar. 28, 1898			
375	Homestake	Amador	E. Becker and Robert Mooney.	Mokelumne	Brush dam	16,000	Jan. 20	Works already built	Feb. 21, 1898	580	2,000
376	Croff	do	W. N. Lamb	Cosumnes	do	235,200	Jan. 25	do	Feb. 28, 1898		50,000
377	Long Ravine	Nevada	B. F. Steese and O. Woehler.	Feather	Stone dam	106,700	Jan. 27	Feb. 28, 1898	Nov, 28, 1898	633	10,000
378	Amo	Butte	J. W. Cummins	do	Log crib dam	4,000,000	do	Mar. 21, 1898	Nov. 21, 1898	3,331	25,000

379	Green Mountain.	Calaveras	John E. Burton	Calaveras	Rock dam		Feb. 8	Mar. 28, 1898	Nov. 7, 1898	2,000	10,000
380	Harville *a*	Eldorado	Harville Mining Co	Cosumnes	Brush dam	508,000	Mar. 8	Works already built	Oct. 10, 1898		
381	Badger Hill	Plumas	A. B. Jacks	Feather	Log dam	2,700	Mar. 9	Apr. 3, 1899			
382	Star of Plumas	do	Star of Plumas Water and Mining Co.	do	Log crib dam		Mar. 10	Nov. 29, 1898	Apr. 8, 1899		
383	Auriole	Amador	Wm. Nolden	Cosumnes	Log dam	60,000	Mar. 21				
384	Beattie	Eldorado	Geo. Beattie	American	Dam of Gold Bug Mine	600	Mar. 23		Dec. 27, 1898	370	
385	Blue Rock	do	Geo. C. Rose	do	do	6,000	Apr. 4		do		
386	Driesbach & Dudley. *b*	Nevada	Driesbach & Dudley	Yuba	Log and brush dam	4,000	do	Apr. 4, 1898			
387	Fair View *a*	do	Wm. E. Moore and John Isbister.	do	do	57,870	Apr. 8				
388	Imperial	Sierra	David Cabona	do	Log and brush barriers on flat.		Apr. 25	Nov. 28, 1898			
389	Pemberton Gravel.	Placer	Sara E. Reamer	American	Log and brush dams	484,000	June 10				
390	Bull Run Placer.	Nevada	Grant Penrose and William Harker.	South Yuba	Log and brush dam	500,000	June 15				
391	Excelsior	do	Excelsior Mining Co.	Feather	Log dam	2,000,000	Sept. 13	Dec. 19, 1898	Jan. 31, 1899	2,500	20,000
392	Fair Play	Sierra	Toy Kee	Yuba	Log crib dam	30,000	Oct. 19	Nov. 7, 1898	May 1, 1899		10,000
393	Gravel Hill	Nevada	S. F. Bullard and A. M. Gray.	do	do	700,000	do	do	Jan. 23, 1899	37,000	50,000
394	Plumas Bonanza.	Plumas	Elmore Rutherford	Feather	Log and brush dam	4,000	do				
395	Hangman's Gulch.	Eldorado	Geo. W. Allen and E. P. Thomas.	American	Two brush dams	1,000	Oct. 22	Works already built	Nov. 28, 1898	511	500
396	Sampson	Sierra	Lusk & Millar	Feather	Log barriers	150	Oct. 28	Dec. 19, 1898	June 19, 1899		1,000
397	Morristown	do	E. Reynolds and F. Carter.	Yuba	Log crib dam	20,000	Oct. 31	Nov. 28, 1898			
398	Meyers Placer	Eldorado	Geo. D. H. Meyers	American	Brush dam	77,440	Nov. 3	Works already built	Nov. 28, 1898	700	10,000
399	Corsica	Sierra	Frank and Antone Leveroni.	Yuba	Log and rock barriers	15,000	Nov. 7	Nov. 28, 1898			
400	Wintz	Eldorado	Wintz Mining and Improvement Co.	Cosumnes	Brush dam	15,000	Nov. 15	Dec. 12, 1898	Jan. 30, 1899		5,000
401	Cleveland No. 2. *c*	Sierra	Joel Bean	Yuba	Log crib dam	50,000	Nov. 16	Works already built	Dec. 12, 1898	4,500	45,000
402	Haskell Valley.	Plumas	J. B. Jones	Feather	Log and brush dam	10,000	Nov. 17	Dec. 12, 1898			
403	Snowy Side	do	Thos. Gomez	do	Log crib dam	20,000	do	do			
404	New York	do	N. H. Friis	do	do	12,000	do	do			
405	Chaplain	do	J. C. Horner	do	do	4,000	do	do			
406	Rocky Bar	do	Llewellyn A. Hoeflich	do	Worked-out pits	24,000	Nov. 21	do			
407	Oriole Gravel	Tuolumne	C. W. Ayers	Tuolumne	Brush dam		Nov. 23	do			
408	Humbug Gulch.	Amador	Rocco Molinari	Mokelumne	do	4,800	Nov. 25	Works already built	Jan. 16, 1899	15	5,000
409	Grizzly Hill	do	J. B. Meek	do	do	4,000	Dec. 15	do	do	101	3,000

a Mine abandoned. *b* Will not be worked by hydraulic process.
c Permit suspended from April 3, 1899, to May 15, 1899, on account of accident to impounding works.

Synopsis of applications for authority to mine, with action taken thereon—Continued.

No.	Name of mine.	County.	Name of applicant.	Mine drains into tributary of—	Nature of tailings reservoir proposed for present use.	Approximate amount of gravel proposed to mine.	Application received.	Order issued to build impounding works.	License granted.	Mined and stored previous to May 1, 1899.	Storage capacity yet available, partly or wholly completed.
						Cubic yds.	1898.			*Cu. yds.*	*Cubic yds.*
410	Emery Placer	Calaveras	Lewis Emery, jr	Calaveras	Log crib dam	600,000	Dec. 15	Jan. 23, 1899	Apr. 24, 1899		40,000
411	Newell Claim	Amador	Archie Newell	Mokelumne	Brush dam	5,600	Dec. 21	Works already built	Jan. 16, 1899		5,000
412	Silver Star Flume and Mining Co.	Plumas	S. S. Taylor	Feather	Worked-out pit	30,000	1899. Jan. 4	do	Mar. 20, 1899		85,000
413	Bonanza Claim	Amador	H. S. Byam	Cosumnes	Brush and earth dam	600,000	Jan. 7	Feb. 1, 1899	Mar. 13, 1899		100,000
414	Badger Hill	Nevada	Badger Hill and Cherokee Gravel Mining Co.	Yuba	Worked-out pit	500,000	Jan. 12	Feb. 13, 1899	June 12, 1899		400,000
415	Cedar Creek	Eldorado	F. M. Phelps	Cosumnes	Log and brush dam	15,000	Jan. 16	Mar. 13, 1899			
416	Badger Hill	Plumas	A. B. Jacks	Feather	Old pits	270	Feb. 1	Apr. 3, 1899			
417	Hoads Ranch	Butte	John H. Hoad	do	Log dam	5,000	Feb. 4				
418	Mountain Ranch.	Calaveras	J. S. Mills	Calaveras	Log-crib dam	363,000	Feb. 6	Feb. 27, 1899			
419	Doherty	Sierra	Hong Fat Co	Feather	do	70,000	Feb. 23	Mar. 20, 1899			
420	Santa Cruz	Plumas	D. M. Butterfield	do	Worked-out pit	700	do	do	May 1, 1899		1,000
421	Spanish Flat	do	Sam Ahtye	Yuba	Rock and brush dam	42,000	Feb. 24	do			
422	Dry Creek *a*	Yuba	J. D. Wetmore and Martin Tufford.	do	Dam of Forbestown Ditch Co. in Dry Creek.		Mar. 1				
423	Gold Bug	Butte	E. H. Adams	Feather	Brush dam	2,000	Mar. 21	Works already built	May 15, 1899		1,000
424	Santa Rosa Placer.	Plumas	John McCollum	do	Log and brush dam	3,000	Apr. 18	do	June 12, 1899		2,000
425	Yankee Hill	do	Plumas Development Co.	Yuba	Log crib dam	8,349	Apr. 24	do	May 15, 1899		8,000
426	North Hill	Calaveras	J. H. Southwick	Calaveras	Earth dam	1,000,000	May 1	June 12, 1899			
427	Ohio Placer	Plumas	T. B. Bennett	Feather	Log and brush dam	14,000	May 6	Works already built	June 12, 1899		12,000
428	York Ranch	do	W. E. Duncan, sr	do	Log and brush dams in-	50,000	May 11	June 12, 1899			

APPENDIX Z Z.

ESTABLISHMENT OF HARBOR LINES IN HONOLULU HARBOR, HAWAIIAN ISLANDS.

TREASURY DEPARTMENT,
OFFICE OF THE COAST AND GEODETIC SURVEY,
Washington, D. C., February 2, 1899.

DEAR SIR: I have the honor to inclose herewith copy of a letter just received from Mr. William A. Kinney, attorney for the Oahu Railroad and Land Company. This company is anxious that steps should be taken toward the fixing of a definite harbor line in the harbor of Honolulu, in order that it may proceed with contemplated improvements. Any great delay in settling this question would apparently work a hardship to these people. As the question of the improvement of harbors is not a part of the work of this Bureau but is under the direction of the Chief of Engineers, the inquiry is respectfully referred to you, with the request that you will give Mr. Kinney such definite answer as may be possible. I shall be glad to transmit your reply to him if sent to this office.

Respectfully, yours,
HENRY S. PRITCHETT,
Superintendent.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
February 6, 1899.

Respectfully submitted to the Secretary of War.

This is a request for the establishment of harbor lines in the harbor of Honolulu, Hawaiian Islands.

These islands were annexed to the United States by joint resolution approved July 7, 1898. This resolution provides, inter alia, that until Congress shall provide for the government of the islands all the civil, judicial, and military powers exercised by the officers of the existing government in said islands shall be vested in such person or persons as the President of the United States shall direct; and further, that the municipal legislation of the islands, not inconsistent with the joint resolution, nor contrary to the Constitution of the United States, shall remain in force until the Congress of the United States shall otherwise determine.

Under the terms of the resolution a Commission was appointed by the President to recommend to Congress such legislation concerning the islands as they shall deem proper.

So far as known, Congress has made no provision for the government of the islands and has enacted no legislation concerning them as contemplated by the joint resolution. I am of the opinion, therefore, that the time has not arrived for the War Department to undertake the establishment of harbor lines in this important harbor. If, ho the opinion of the Secretary of War the establishment of ha in Honolulu is permissible under present conditions of law, and which should have immediate consideration, it is suggested consideration can be secured by the appointment of a Boar from the officers of the Third Battalion of the Second United States Volunteer Engineers, now stationed in Honol the command of Maj. W. C. Langfitt, United States Volunte battalion is not under the orders of the Chief of Engineers, commanding general Department of California.

JOHN M. WILS
Brig. Gen., Chief of Engine
U.

[Third indorsement.]

WAR DEPARTMENT,
JUDGE-ADVOCATE-GENERAL'S OFF
Washington, D. C., February

Respectfully returned to the Secretary of War.

It is understood that the legal question raised in within co tion is whether the Secretary of War has authority, unde laws, to cause harbor lines to be established in the harbor of Hawaiian Islands.

Under joint resolution of July 7, 1898, the Hawaiian Islan "a part of the territory of the United States and subject to eign dominion thereof;" and there is no provision in the reso the laws of the United States with respect to harbor lin were intended to operate throughout the United States, s apply to these islands, as there is with respect to the law to public lands, the laws relative to customs, etc. I am o therefore, that if it is made manifest to the Secretary of Wa establishment of harbor lines is essential to the preservatio tection of the harbor of Honolulu, he may cause them to be e under section 12 of the river and harbor act of September (26 Stat. L., 455.)

G. N. LIEB
Judge-Advocate-

[Fourth indorsement.]

WAR DEPARTMENT, *March*

Respectfully referred to the Adjutant-General to have a B vened in accordance with the suggestion of the Chief of Eng

By order of the Secretary of War:

JOHN TWEEDALE, *Chie*

[Fifth indorsement.]

HEADQUARTERS OF THE ARMY,
ADJUTANT-GENERAL'S OFFI
March 1

Respectfully referred to the commanding general Departme fornia, San Francisco, Cal., who will convene a Board of O Honolulu, in accordance with suggestion of the Chief of Eng first indorsement hereon.

By command of Major-General Miles:

W. H. CART
Assistant Adjutant-

[Sixth indorsement.]

HEADQUARTERS DEPARTMENT OF CALIFORNIA,
San Francisco, Cal., March 23, 1899.

Respectfully referred to Maj. William C. Langfitt, Second U. S. Volunteer Engineers, Honolulu, Hawaiian Islands, for the information of the Board of Officers appointed by paragraph 3, Special Orders, No. 59, current series, from these headquarters, and of which he is the president.

By command of Major-General Shafter:

J. B. BABCOCK,
Assistant Adjutant-General.

[Seventh indorsement.]

HONOLULU HARBOR LINE BOARD,
Honolulu, Hawaiian Islands, April 15, 1899.

Respectfully returned to the assistant adjutant-general, Department of California, inviting attention to the report of the Board, dated April 15, 1899.

W. C. LANGFITT,
Major Second U. S. Vol. Engineers, President of the Board.

[Eighth indorsement.]

HEADQUARTERS DEPARTMENT OF CALIFORNIA,
San Francisco, Cal., May 2, 1899.

Respectfully returned to the Adjutant-General of the Army, inviting attention to the inclosed report and maps[1] made by the Board of Officers appointed by paragraph 3, Special Orders, No. 59, current series, from these headquarters.

WM. R. SHAFTER,
Major-General, Commanding.

[Ninth indorsement.]

ADJUTANT-GENERAL'S OFFICE,
Washington, May 10, 1899.

Respectfully returned to the Secretary of War, with report inclosed of the Board convened in accordance with the suggestions of the Chief of Engineers, as directed in the fourth indorsement hereon.

H. C. CORBIN, *Adjutant-General.*

[Eleventh indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
June 6, 1899.

Respectfully returned to the Secretary of War.

Application having been made for the establishment of harbor lines in the harbor of Honolulu, Hawaiian Islands, a Board of Officers was, by direction of the Secretary of War, constituted by the commanding general, Department of California, to consider and report on the subject.

The report of the Board, dated April 18, 1899, is herewith, accompanied by a tracing on which is delineated the harbor line recommended by the Board for adoption by the Secretary of War under the provisions of section 11 of the act of Congress approved March 3, 1899.

---

[1] Not printed.

It is respectfully suggested that before taking definite ac
the harbor lines of Honolulu, a copy of the report and tracin
mitted to the present authorities of Honolulu for an exp
opinion.

These lines have been recommended solely with a view t
tection of the harbor and the convenience of the navigation
but it is proper to remark that the harbor lines proposed by t
and shown on the tracing, do not appear to accord in all resp
the wishes and views of the local authorities of Honolulu.

JOHN M. WILSON,
Brig. Gen., Chief of Engine
U. S

WAR DEPARTMENT, *June 1*

The harbor lines proposed by the Board are approved as m
the within description.

G. D. MEIKLEJOHN,
Acting Secretary

MEMORANDUM OF DESCRIPTION TO SUBSTITUTE FOR THE ONE IN THE THE BOARD.

East side of harbor.—Beginning at the northeast corner of the harbor,
the intersection of Kakauleki and King streets is S. 66° 25′ E. 360 fee
which the intersection of the south line of King street and the east lin
street is N. 62° 25″ E. 355 feet, thence S. 2° 14′ W. to the NW. corner of
wharf, thence S. 7° 15′ E. to the NW. corner of the Nuuanu street whar
21° 44′ E. along the face of said Nuuanu street wharf, passing Brewer'
feet west of its west face and continuing to a point where said line in
west line or wharf front of what is known as the Robinson property, th
14′ W. along the wharf line of said Robinson property 275 feet, thence S
along the front of the Oceanic Steamship Company's wharf to a point 15
the west corner of said line, thence S. 11° 35′ W. along the front line o
Island Steam Navigation Company's wharf through the westerly cor
Kekaunoa wharf to a point 20 feet beyond said corner, thence S. 31° 17′ E
225 feet S. 6° 15′ E. of southerly corner of the Pacific Mail Steamship
wharf, thence S. 6° 17′ E. 60 feet, thence S. 8° 55′ W. 440 feet, thence S
parallel to and 210 feet distant from the sea wall 2,110 feet to a point or
contour, thence S. 7° 00′ E. to deep water.

West side.—Beginning at the same starting point, thence S. 89° 30′ W.
60 feet distant from easterly boundary line of the Oahu Railway and
pany; this 60 feet measured in a direction perpendicular to the said bou
thence in a southerly direction on a line parallel to and 60 feet from t
boundary line of said company's property to a point where this parallel
sects the southerly boundary prolonged to the westward; thence S. 71°
feet and along the southern boundary of said property to its southe
thence following approximately the 6 foot contour of depth as follows: S
420 feet, thence S. 31° 00′ W. 320 feet, thence S. 13° 56′ W. 535 feet, then
W. 720 feet to the extreme easterly point of the Quarantine wharf, thenc
E. 350 feet, thence S. 51° 30′ E. 620 feet, thence S. 22° 10′ E. 270 feet to a p
east of the easterly corner of the light-house, thence S. 25° 45′ W. 190
S. 41° 45′ W. 1,770 feet, thence S. 73° 00′ W. to deep water.

REPORT OF BOARD OF ENGINEERS.

HARBOR LINE BOA
Honolulu, Hawaiian Islands, April 1

SIR: In compliance with your indorsement of March 3,
Board of Officers to determine and recommend harbor lines to

bed in the harbor of Honolulu, Hawaiian Islands, has the honor to
bmit the following report:

A public meeting in this matter was given April 14, 1899. This
eting had been advertised in the public press, and other means taken
bring it to the notice of all interested parties. As a result, the meet-
g was largely attended by representative business men of the island,
d a report of the same is herewith inclosed, marked "Appendix A."[1]

In accordance with various recommendations made by parties attend-
g the meeting, and a letter received from the Honolulu Chamber of
mmerce, hereto attached, marked "Appendix E," and careful per-
nal investigation of the lines at present determining the harbor, the
ard, after deliberation, has decided to recommend a harbor line as
lows:

* * * * * * *

Accompanying this report is a tracing[1] showing the proposed line.

Respectfully submitted.

W. C. LANGFITT,
Major, Second U. S. Volunteer Engineers.
FRED. J. H. RICKON,
Captain, Second U. S. Volunteer Engineers.
H. A. SPRINGETT,
Captain, Second U. S. Volunteer Engineers.

The ASSISTANT ADJUTANT-GENERAL,
DEPARTMENT OF CALIFORNIA,
San Francisco, Cal.

APPENDIX B.

LETTER OF MR. C. H. KLUEGEL.

HONOLULU, HAWAIIAN ISLANDS, *April 14, 1899.*

ENTLEMEN: The harbor line shown on the accompanying map is respectfully
mitted for your consideration.

he harbor of Honolulu is small. Its limits, as defined by the harbor line, should
o established as to give all the area available with a reasonable expenditure of
ey, and to give the opportunity for constructing convenient slips and wharves.
se conditions and requirements are met by the plan submitted.

o permanent wharf should extend over this line into the harbor.

he basin at the north end of the harbor should be wide enough for conveniently
ing vessels while others are lying at both wharves, and for an anchorage for
ller craft.

harves and slips which the Oahu Railway and Land Company proposes to con-
ct are shown on the map.

s the necessity arises for more wharves and slips, they may be constructed along
west side of the harbor.

he length of the frontage from the railway wharf to the light-house is 3,000 feet.
h slips 120 by 300 feet and wharves 80 by 300 feet, 30 berths of 300 feet each, or
ggregate wharfage of 9,000 feet, can be provided, not counting the ends of the
rves.

espectfully submitted.

C. H. KLUEGEL,
Chief Engineer Oahu Railway and Land Company.

o the BOARD OF OFFICERS APPOINTED TO REPORT ON
HARBOR LINES FOR HONOLULU HARBOR.

---

[1] Not printed.

LETTER OF MR. F. M. HATCH.

HONOLULU, *April*

GENTLEMEN: On behalf of the Oahu Railway and Land Company I beg
the following views:

First—This company does not put itself in opposition to any of the p
gested by the Hawaiian government respecting the harbor line or the
wharves or to any portion of the suggestions made by the minister of the
other than the width of the space to be left for harbor purposes at the mo
Nuuanu Stream.

Second—As to the width of the mouth of Nuuanu Stream, it is submitte

(*a*) Of two plans furnishing approximately the same wharf room that w
vides the greater harbor space is the preferable.

(*b*) The width of 300 feet suggested by the railroad company is no mor
needed, because the line should be established so that it would be possible
ships as follows: It should be made possible for ships moored on either si
branch of the harbor to receive and discharge freight simultaneously from
and from another vessel lying on the other side of the ship so being di
This is a condition which often arises in Honolulu, and is very likely to be
quent in the future. Thus there will be four vessels in this space. The
still be room enough left between the two inner vessels for the easy passag
vessels up and down, so that berths could be shifted without disturbing t
which were being loaded and discharged as aforesaid. It would be a mis
this central space were made so narrow as to render the towing of a squa
vessel through it difficult or dangerous. Every foot gained would be
public gain for the benefit of navigation.

Third—As to the line on the west and south side, it is submitted that
of space gained would be a public benefit. The line of 5 feet depth is pre
that of 6 feet depth. The line of 4 feet depth would be better still.

Respectfully submitted.

F. M. H
For the Oahu Railway and Land C

THE BOARD OF COMMISSIONERS ON HARBOR LINES
FOR THE HARBOR OF HONOLULU.

APPENDIX E.

LETTER OF MR. JAMES GORDON SPENCER, SECRETARY HONOLULU CHA COMMERCE.

HONOLULU CHAMBER OF COMMERCE,
Honolulu, Hawaiian Islands, April

DEAR SIR: I return herewith Hawaiian government blue-print map of
Harbor, kindly loaned to the Honolulu Chamber of Commerce for referenc

I am instructed by the chamber to send you the following resolution pa
meeting to-day:

Voted, That the chamber still approves of the recommendation of its
for the extension of the Likelike, Kinau, Brewer, Nuuan, and Sorenson w
relieve the present congested conditions, and it is further recommended
extensions be allowed to be made immediately and to remain until other
dations are provided.

I refer you to the Hawaiian government map, returned herewith, for the
extensions of wharves.

Yours, very truly,

JAS. GORDON SPENC
Secretary Honolulu Chamber of Co

Maj. WILLIAM C. LANGFITT,
Honolulu, Hawaiian Islands.

LETTER OF MR. W. A. KINNEY.

THE ARLINGTON,
Washington, D. C., January 28, 1899.

R SIR: In behalf of and as the attorney of the Oahu Railroad and Land Com-
and of B. F. Dillingham and Mark P. Robinson, owners in fee simple and les-
large tracts of tide lands and harbor frontage in the harbor of Honolulu,
Hawaiian Islands, I desire to call your attention officially to the overcrowded
ion of the harbor in question, and the imperative necessity of immediate harbor
vements to provide new wharfage sufficient to move the present sugar crop,
nerally to meet the requirements of commerce at that port.
lack of wharf room is resulting in the pérmanent blocking of transportation,
sses therefrom have led recently to urgent protests to the local government
he local chamber of commerce and the business interests of the islands. For
l years the wharves have been very much overcrowded and demurrage has
omething excessive, and to meet this condition of things the government
l years ago made arrangements for extensive improvements in the harbor but
layed carrying them out, largely through certain litigation pending between
etitioners and the local government which the government desired out of the
efore it proceeded. This litigation concerning the ownership of certain of the
nds and wharf frontage claimed by petitioners has, however, been unduly
ged for one reason or another, until conditions have become intolerable.
local government is now ready, regardless of the litigation in question, to
d forthwith to enlarge the harbor, and the petitioners, who have likewise
lelayed by the litigation in question from making new wharves, are also now
to spend at least $250,000 upon wharf improvements. But conditions have
hanged through annexation, and the local government no longer feels justified
ng a permanent harbor line, believing this should be left to the National Gov-
nt. The fixing of this harbor line is an absolute prerequisite to the improve-
contemplated by the petitioners.
losed you will find a memorandum of the improvements contemplated by peti-
s, as well as those by the local government as filed in your Department. Of
these plans are subject to alteration, depending somewhat upon the harbor
hat may be established; but in any event the improvements contemplated by
oners will call for an expenditure of $250,000, and probably much more.
ler these circumstances I therefore make formal request that a permanent har-
e for the west side of Honolulu Harbor be established forthwith, this request
made by the special authority of the petitioners, it being also understood that
cal government as well would be relieved to have the harbor line in question
ished at once.

Yours, very respectfully,

WM. A. KINNEY,
Attorney for B. F. Dillingham, Mark P. Robinson,
Oahu Railroad and Land Company.

NRY S. PRITCHETT, Esq.,
Superintendent of the U. S. Coast and Geodetic Survey, Washington, D. C.

B. F. Dillingham proposes to make the following improvements in the harbor
nolulu, which is called the "railroad plan:"
He proposes to build a wharf, say 50 feet wide, from the makai side of the
sion of Queen street and 800 feet long. Directly makai of Queen street wharf
er wharf is to be built, size 800 by 100. The last-named wharf would be
ached by a bridge connecting it with the northwest end of Queen street, where
ns up to unite with King street. These two wharves would supply 2,400
feet of room for docking ships of the largest or smallest size, at a total cost of
00.
This plan provides for a system of parallel wharves and slips running about
ht angles to the proposed Government wharf. This plan will eventually cre-
additional wharf frontage of 5,200 feet, or more than eight times as much as
overnment plan.
government of Hawaii propose to make the following improvements in the
r of Honolulu:
They propose to construct a wharf commencing at the Lime Kiln and extend-
Sumner's House, a distance of 2,000 feet, wharf to be 100 feet wide. Total
$252,055. This is for 2,000 linear feet of wharf room.
To fill in or reclaim the shallow tide lands between the wharf and the shore,
y 15 acres, requiring, at a rough estimate, about 150,000 cubic yards of material.

APPENDIX A A A.

BRIDGES AT WASHINGTON, DISTRICT OF COLUMBIA.

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*ORT OF LIEUT. COL. CHAS J. ALLEN, CORPS OF ENGINEERS,
FICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1899,
TH OTHER DOCUMENTS RELATING TO THE WORKS.*

pair of the Aqueduct Bridge across Potomac River at Washington, District of Columbia.

2. Memorial bridge across Potomac River at Washington, District of Columbia.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., July 22, 1899.

ENERAL: I have the honor to forward herewith * * * my
al report for year ended June 30, 1899, for memorial bridge and
irs to the Aqueduct Bridge, * * *.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers.

ig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

A A A 1.

IR OF THE AQUEDUCT BRIDGE ACROSS THE POTOMAC RIVER AT WASHINGTON, DISTRICT OF COLUMBIA.

ngress by act of June 8, 1896, appropriated as follows:

airs to Aqueduct Bridge: For reconstruction of pier numbered four of the
luct Bridge across the Potomac River at Georgetown, District of Columbia, to
ailable until expended, sixty-five thousand dollars.

r an account of operations following that appropriation reference
spectfully made to Appendix A A A, Annual Report of the Chief
gineers for the fiscal year ended June 30, 1898.

WORK OF THE FISCAL YEAR ENDING JUNE 30, 1899.

March 27, 1899, public advertisement was made inviting pro-
ls for repairing the pier. At the opening of the proposals on April
899, four bids were received, an abstract of which is appended to
report. The contract was awarded to the lowest bidder, viz, The

Central Contracting Company of New York. The contract v
May 12 and approved May 26, 1899, the work to commen
before May 15 and to be completed on or before Novembe
The contractors had not, however, commenced the work by
of the fiscal year.

Money statement.

July 1, 1898, balance unexpended......................................	
June 30, 1899, amount expended during fiscal year..........................	
July 1, 1899, balance unexpended......................................	
July 1, 1899, outstanding liabilities	$100.00
July 1, 1899, amount covered by uncompleted contracts......	37,747.00
July 1, 1899, balance available..	

Abstract of proposals for reconstruction of pier No. 4 of the Aqueduct Bridge
Columbia, received in response to advertisement dated March 27 and open
1899, by Lieut. Col. Charles J. Allen, Corps of Engineers.

	Central Contracting Company, New York, N. Y.		George C. Esher, Washington, D. C.		Engineering Contract Company, New York, N. Y.		Al Ba
	Per cubic yard.	Amount.	Per cubic yard.	Amount.	Per cubic yard.	Amount.	Pe cub yar
For repair and maintenance of false work and cofferdam, including all items specified for same........	....	$2,400	....	$4,000	....	$1,500	....
For pumping out cofferdam, including all items specified for same........	....	1,800	....	3,000	....	2,000	....
For removal of false work and cofferdam, including all work specified for the same........	....	3,600	....	5,000	....	4,000	....
Removal of old masonry, not including the removal of coping (1,420 cubic yards).............	$5.00	7,100	$3.00	4,260	$8.00	11,360	$12.
For excavation, including the removal of débris (200 cubic yards)........	5.00	1,000	5.00	1,000	5.00	1,000	12.
For concrete (210 cubic yards)................	14.00	2,940	8.00	1,680	15.00	3,150	25.
For quarry-faced ashlar masonry (460 cubic yards)................	23.00	10,580	45.00	20,700	30.00	13,800	18.
For interior-header masonry (45 cubic yards)........	35.00	1,575	45.00	2,025	30.00	1,350	35.
For rubble masonry (620 cubic yards).............	10.00	6,200	4.00	2,480	10.00	6,200	10.
For removing and resetting coping (21 cubic yards)..................	12.00	252	5.00	105	12.00	252	18.
For repair of iron trusses, including all work specified therefor............	....	300	....	50	....	500	....
Total..............	....	37,747	....	44,300	....	45,112	....
Commence...............	May 15, 1899.		Ten days after award.		May 10, 1899.		Ma
Complete................	Nov. 30, 1899.		Six months.		Nov. 1, 1899.		Jul

A A A 2.

ORIAL BRIDGE ACROSS POTOMAC RIVER AT WASHINGTON, DISTRICT OF COLUMBIA.

ngress by act approved March 3, 1899 [Public—No. 188], made ollowing appropriation:

norial bridge across Potomac River: To enable the Chief of Engineers of the to continue the examination of the subject and to make or secure designs, calions, and estimates for a memorial bridge from the most convenient point of aval Observatory grounds or adjacent thereto across the Potomac River to the convenient point of the Arlington estate property, the sum of five thousand rs.

eceding this appropriation was one by act of Congress of June 97, providing for surveys, soundings, etc., and for securing designs estimates for a memorial bridge between the same points. The rt upon the survey is published as Document No. 388, House of resentatives, Fifty-fifth Congress, second session. A project for application of the appropriation of March 3, 1899, was rendered. was decided to invite the furnishing of designs, by competition, a limited number of bridge engineers, but the names had not been rmined upon at the close of the fiscal year.

Money statement.

unt of appropriation	$5,000

APPENDIX B B B.

SHINGTON AQUEDUCT, INCREASING THE WATER SUPPLY OF WASH IGTON, AND INVESTIGATING THE WATER SUPPLY OF WASHINGTON, ISTRICT OF COLUMBIA.

PORT FOR THE FISCAL YEAR ENDING JUNE 30, 1899. OFFICERS IN HARGE, COL. THEO. A. BINGHAM, UNITED STATES ARMY, AND IEUT. COL. A. M. MILLER, CORPS OF ENGINEERS.

OFFICE OF THE WASHINGTON AQUEDUCT,
Washington, D. C., July 21, 1899.

ENERAL: I have the honor to forward herewith the annual reports Washington Aqueduct, increasing water supply of Washington, C., and investigating the water supply of Washington, D. C., for fiscal year ending June 30, 1899.

Very respectfully, your obedient servant,

A. M. MILLER,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

B B B 1.

WASHINGTON AQUEDUCT.

ppropriations for the Washington Aqueduct are applied to the rovement, maintenance, and repair of all of those parts of the water ply that have been placed under the supervision of the Chief of gineers, except the new reservoir near Howard University and the nel connecting it with the distributing reservoir. These are the sonry dam across the Potomac at Great Falls, the works there for ulating the supply to the conduit, the Conduit road from Great ls to Washington, a distance of about 14 miles, the conduit from at Falls to the distributing reservoir, the three reservoirs for suping the city, the mains for delivering water from the reservoirs into city's distributing system, and the two bridges for carrying the ins across Rock Creek.

he water supply is taken from the Potomac River at Great Falls, ut 14 miles above the city.

t this point a masonry dam extends across the river from the Maryd to the Virginia shore. Its total length is 2,877 feet, and the width its crest in the Virginia channel and across Conns Island is 8 feet nches and in the Maryland channel 7 feet 9 inches. In 1895–96 the st of the dam was raised from a reference of 148 feet above mean

tide at the Washington Navy-Yard to 150.5 feet above the s
plane.

The top of the mouth of the feeder of the conduit at Gr
at a reference of 149 feet and the bottom at a reference of 1

The water passes from the feeder through the gatehou
the conduit, which at this point has a reference of 152
interior surface of the crown of the arch.

The slope of the conduit is uniform between the gatehous
Falls and the distributing reservoir and is 9 inches in 5,000

The conduit is circular in cross section, and for the gre
its entire length is 9 feet in diameter and composed eithe
masonry plastered or of 3 rings of brick, but where the so
it was built was considered particularly good the inner ri
was omitted and the diameter is 9 feet 9 inches. Where t
passes as an unlined tunnel through rock, the excavation wa
to contain an inscribed circle 11 feet in diameter.

The lengths of the conduit and its connections are as foll

Length of feeder at Great Falls, 256 feet.

Area of cross section at mouth, 157.45 square feet.

Length of conduit between gatehouse at Great Falls and
nection of Dalecarlia Reservoir, 47,896.5 feet; least diamete

Length of by-conduit around Dalecarlia Reservoir, 2,
diameter for 625 feet, 8 feet; for rest of distance, 9 feet.

Length of conduit between south connection of the Daleca
voir and north connection of the distributing reservoir, 10,1
diameter of conduit, 9 feet.

Length of by-conduit around the distributing reservoir, 2,
diameter, 7 feet.

At the distributing reservoir the water passes into 4 cast-
48 inches, 36 inches, 30 inches, and 12 inches in diameter, re

The Dalecarlia Reservoir has a storage capacity of about
gallons, is practically without paved slope wall, is perfectly
against pollution from the drainage of the surrounding co
is provided with a spillway, the reference of the bottom
146.5 feet. The reference of the interior surface of the cr
arch of the conduit at the north connection of this reservoi
feet and at the south connection 143.39 feet. The distanc
these points, measured along the line of flow of the water
reservoir, is about 3,550 feet.

The distributing reservoir has a storage capacity of about
gallons and is divided by a puddled and paved wall, throug
a passageway which can be closed with stop planks into tw
containing 97,600,000 and 53,250,000 gallons, respectively.

The interior surface of the crown of the arch of the cond
north connection of this reservoir has a reference of 141.87 f

The Georgetown high-service reservoir is circular in pla
an available capacity of about 1,500,000 gallons. The refer
water surface when the reservoir is full is 220.5 feet. Alt
reservoir is under the charge of this office, the duty of keepi
by pumping devolved upon the water department of the
Columbia until it was taken out of service, November 17, 1
request of the Commissioners of the District of Columbia
Reno Reservoir and the pumping service having rendered
use inadvisable except in case of emergency.

In addition to the three reservoirs already mentioned, wh
part of the aqueduct system, there is another reservoir, bui

led by the Commissioners of the District of Columbia, called the t Reno Reservoir, with a capacity of about 4,500,000 gallons, the rence of its water surface when the reservoir is full being about feet. This reservoir is supplied with water taken from the supply ns by the U street pump.

he Dalecarlia and distributing reservoirs supply that part of the trict which lies below 100 feet above datum. The areas lying ween the levels of 100 and 210 feet above datum are supplied by nping from the U street station directly into the distributing mains, Georgetown high-service reservoir being held as a reserve supply. e areas having a greater elevation than 210 feet above datum are plied from the Fort Reno Reservoir.

t will be observed, therefore, that the total present storage capacity ll reservoirs is a little less than 307,000,000 gallons, or about six s' normal supply.

ntil the average daily consumption of water becomes considerably ater than at present, the reference of the surface of the water at lowest stage of the Potomac will be about 151 feet at the mouth of feeder at Great Falls, about 146.75 feet at the Dalecarlia Reservoir, l 146 feet at the distributing reservoir.

he total supply of water which the present conduit can safely fur- h, without a pressure dangerous to its safety, is 76,000,000 gallons diem. This, however, necessitates the lowering of the distributing ervoir to reference 144, thus involving a loss of head of 2 feet at t point of distribution.

he following statement shows the operations upon the aqueduct l its accessory works during the fiscal year, and their condition at close:

GATEHOUSES, WATCHMEN'S QUARTERS, AND OTHER BUILDINGS.

he gatehouses and storehouses at the Dalecarlia and distributing ervoirs were covered with a wash of Portland cement and the iron l woodwork painted. The office was also painted.

he buildings at Great Falls were whitewashed and all necessary airs for the proper preservation of these buildings were made.

THE RESERVOIRS.

severe rainstorm on August 13 caused considerable damage at Dalecarlia Reservoir. The rainfall between the hours of 11 a. m. l 8 p. m. was 5.44 inches. This heavy precipitation caused a rapid e in Powder Mill Branch, Mill Creek, and East Creek.

he surface drainage which these streams collect is prevented from ering the Dalecarlia Reservoir by dams at their mouths. The ter of East and Mill creeks and the surface drainage in the immedi- vicinity of the reservoir are carried in a runaround channel and ough a tunnel which empties the water into Powder Mill Creek ve the dam, shutting off the latter from the reservoir, then by a ft and tunnel into the spillway of the reservoir and so into the omac River.

he flood water of this storm reached its highest point at 6 p. m., aining a height of 8 feet above the coping of the shaft of the main inage tunnel and covering the bottom land of Powder Mill Branch half a mile above the shaft to a depth of from 2 to 5 feet. The dam Powder Mill Branch was uninjured, and remained 6 feet above the

flood level. The water, however, reached a stage of 6
the Mill Creek Dam, and 3 inches above the dam on East
channels around the reservoir were overflowed, and the en
the 9-foot channel gave way for a distance of 45 feet at a w
the smallest or 2-foot channel for a distance of 26 feet.
of Mill Creek washed away the reservoir side of the dam
of 280 feet, and a large deposit of gravel and sand was le
dam and in the drainage channels. The damage to t
repaired at once, repairs being completed by October 30.
consisted in closing the break in the drainage channel, ra
Creek dam 18 inches, the East Creek dam 1 foot, and the e
of the drainage channels to heights corresponding to the
of the dams.

The break in the drainage channel was repaired by p
weak part a concrete core in the embankment, the repairs
and raising of the channel embankments being in earthw
It is believed that this raising of the dams and embankm
vent further overflow or breaks.

At the distributing reservoir 1,200 feet of new board fe
all old fences repaired, and daily observations of turbid
were taken at both reservoirs and at the influent at Great

During the year, except when the water was lowered fo
of measuring the daily consumption, the extreme fluctu
in the distributing reservoir was 1.50 feet.

The following table gives the fluctuation from and inclu
1894–95 to date, June 30, 1899:

Year.	Lowest.	Date.	Highest.	Da
	Feet.		*Feet.*	
1894–95	141.45	February, 1894	145.55	March, 1895
1895–96	144.15	July, 1895	145.95	April and
1896–97	145.08	January 30, 1897	146.08	November
1897–98	145.65	February 2, 1898	146.10	April 27, 18
1898–99	144.55	February 16, 1899	146.05	April 16, 18

This low level, 144.55, on February 16, was due to the s
weather, the thermometer reading as follows:

	Degrees.	
February 9	— 8	February 14
February 10	— 8	February 15
February 11	—13	February 16
February 12	+ 5	February 17
February 13	+ 5	

During such readings of the thermometer the household
majority of cases, left running to prevent freezing, due
plumbing.

THE DAM AT GREAT FALLS.

The dam at Great Falls was repaired with 300 cubic ya
backing. These repairs are necessary annually on acc
destruction of the riprap dam due to the passage of i
débris over the dam.

Except for this slight damage, the dam remains intact a
condition.

THE CONDUIT ROAD AND ITS FENCES.

'or use in repairing the conduit road 600 cubic yards of stone were
shed and spread on the road near the Dalecarlia Reservoir. Gen-
l repairs were made to all portions of the road, ditches were cleaned,
hes cut down, slopes trimmed, deposits removed from the culverts,
l four small road culverts were constructed.

'here were purchased 3,116 cubic yards of flint stone for macadam-
g and repairing the conduit road. Eleven thousand five hundred
l twenty feet of guard fence were built on the embankments, the old
rd fences were repaired, and all fences whitewashed.

t has been customary to submit an annual estimate for the repair
he conduit road.

s the keeping of this road in proper order is a necessary item in
repair and maintenance of the Washington Aqueduct as long as it
ept open to public traffic, it is not deemed necessary to submit a
cial estimate for this purpose. The road is essentially a part of the
ueduct system, and the expense of improving it and keeping it in
er would seem a proper charge to the improvement, maintenance,
l repair of the Washington Aqueduct.

THE MAINS.

'he trunk mains, aggregating 21 miles in length, which lead from the
tributing reservoir and supply the distributing system of street
ins, were laid by the United States and are under the control of
s office, but the distributing mains were laid by the city of Wash-
ton and the District of Columbia, and are under the care and
trol of the Commissioners of the District.

break occurred in the 24-inch main at Tenth and K streets north-
t on October 23, 1898, and was repaired in seventeen hours.

everal leaks in joints of the 48-inch main on M street and a leaky
it in the 30-inch main at the intersection of New Jersey and Massa-
isetts avenues were repaired by calking.

'he 30-inch main at the intersection of New Jersey and Massachusetts
nues, which was so near the surface as to interfere with the chang-
of the electric railway at this point to the underground-trolley
tem, was lowered for a length of 230 feet from 0 at the ends to 30
hes at the mid-length joint. The work of lowering was conducted
ler the supervision of this office but at the expense of the railway
ipany.

'wenty-inch connection was made with the 48-inch main at Seven-
ith and R streets northwest by the District Commissioners for the
pose of increasing the supply at the U-street pumping station.

THE BRIDGES.

ll the bridges are now in excellent condition. The iron bridge sup-
ting the 48-inch main across Rock Creek was painted and small
airs were made to the Pennsylvania Avenue Bridge and Dalecarlia
ervoir Bridge.

'he roadway of Pennsylvania avenue, which in the vicinity is 53.5
in clear width, is contracted on the bridge to a clear width of but
'eet, and as drivers are required to walk their teams while passing
r the bridge, a congestion of travel results during the busiest hours
he day, causing delay and annoyance, as there is not room for one

team to pass another, and consequently the speed of all te
bridge moving in the same direction is limited by that of th
front. Especially is this annoyance felt by the thousands
riders who daily pass over the bridge and who, unless e
riders, are frequently forced to dismount and lead their bi
the bridge, the rate of progress of the teams blocking th
ahead being too slow to allow an inexperienced rider t
equilibrium. In addition, the sightly appearance of the
much injured by the extreme contraction at this point.

This bridge, the property of the Washington Aqueduc
graceful in appearance and is unique among the bridges of
in that the roadway is supported upon arched ribs form
48-inch cast-iron pipes, through which flows at least half of
consumed by the city. It would seem, therefore, that any pla
the bridge should preserve both the graceful form and the
features of the bridge.

A board of engineers, constituted by Special Orders, No. 8
2, 1877, and composed of the following officers of the Uni
Corps of Engineers, Bvt. Maj. Gen. Z. B. Tower, Bvt. Maj.
Wright, and Bvt. Maj. Gen. Q. A. Gillmore, was assembled
into the propriety of certain proposed modifications of th
This board, after due consideration of the matter, reported

> It would, in our opinion, therefore, better accord with the position
> vania avenue and with the general character and architectural eff
> aqueduct structures to widen this structure, without changing its de
> addition of two arched iron ribs similar to those of the present br
> widening the abutments.
>
> These two arched ribs should be made about as heavy as those of
> bridge. As the previous discussion shows the latter to be abunda
> without the truss work, in the new construction the greater portion
> weight of the bridge could be thrown upon the added arches not us
> pipes.
>
> We regard the arch as far more sightly, beautiful, and architectur
> truss, and therefore more suitable for this position.

On April 26, 1877, the late Gen. Thomas L. Casey, Uni
Corps of Engineers (retired), then in charge of the Washing
duct, was requested by the Chief of Engineers to inves
report upon "the present and prospective use of that bridge
way, etc." This he did on July 19, 1877, his report conclu
the following opinion:

> I am further of opinion that the present and prospective interests of
> of Washington and Georgetown do demand an increase in the width
> way and of the footways, the present width being, of the roadway only
> of the footways 4½ feet each.
>
> The abundant strength and stiffness of the present bridge, under an
> moving loads that are likely to be placed upon it, are clearly shown by
> gations of the board of engineers, as detailed in its report of April 7
> agree with it as to the manner in which the widening of the road a
> should be accomplished, should it be decided to increase their width
> the addition of two arched iron ribs, similar to those of the present br
> widening the abutments. The estimated cost of widening the bridge in
> above stated is $75,000.

While it is believed that the interest and convenience of t
of Washington and Georgetown demand the widening of t
yet because the present structure amply suffices for all rec
of the Washington Aqueduct system, and because during th
years no official complaints regarding the width of the br
been made to this office, no estimate is submitted for this

nates for the next fiscal year being confined to those subjects
ctly affecting the operation of the Washington Aqueduct.

THE TELEPHONE LINE.

nall repairs have been necessary to maintain the line in excellent
lition.

CONSUMPTION AND WASTE OF WATER.

leasurements of the daily and hourly consumption and waste of
er were made on June 21, 22, 1899, and detailed record of the meas-
nents is given in the following table:

Measurements of the daily and hourly consumption and waste of water.

Iourly and total flow from the distributing reservoir for twenty-four hours, ending at 6 a. m.]

Hours.	Outflow per hour (gallons), June 21, 22, 1899.	Remarks.
n. to 7 a. m	2, 534, 492	City temperature in the shade at 2 p. m., June 21, 1899, 88° F.; weather clear.
n. to 8 a. m	2, 671, 042	
n. to 9 a. m	2, 386, 187	
n. to 10 a. m	2, 382, 551	
m. to 11 a. m	2, 379, 158	
m. to 12 noon	2, 375, 765	
oon to 1 p. m	2, 232, 548	
n. to 2 p. m	2, 368, 856	
n. to 3 p. m	1, 948, 179	
n. to 4 p. m	2, 362, 432	
m. to 5 p. m	2, 497, 651	
n. to 6 p. m	1, 939, 816	
n. to 7 p. m	2, 352, 373	
m. to 8 p. m	2, 072, 730	
n. to 9 p. m	2, 207, 827	
m. to 10 p. m	2, 204, 917	
m. to 11 p. m	1, 651, 446	
m. to 12 midnight	1, 787, 278	
idnight to 1 a. m	1, 647, 880	
n. to 2 a. m	1, 371, 843	
n. to 3 a. m	1, 644, 781	
n. to 4 a. m	1, 506, 169	
n. to 5 a. m	1, 641, 265	
n. to 6 a. m	1, 912, 669	
Total	50, 079, 855	

rage daily consumption and waste of water in the city, as measured annually in the latter part of June of each year, from 1874 to 1899, both inclusive.

Year.	Gallons.	Year.	Gallons.	Year.	Gallons.
	17, 554, 848	1883	24, 314, 715	1892	41, 161, 780
	21, 000, 000	1884	24, 827, 113	1893	46, 727, 108
	24, 177, 797	1885	25, 219, 194	1894	49, 162, 357
	23, 252, 932	1886	25, 542, 476	1895	47, 182, 681
	24, 885, 945	1887	26, 878, 424	1896	44, 113, 574
	25, 947, 642	1888	29, 115, 774	1897	45, 267, 047
	25, 740, 138	1889	27, 708, 779	1898	47, 288, 733
	26, 525, 991	1890	35, 541, 845	1899	50, 079, 855
	29, 727, 864	1891	38, 594, 743		

From the above table it will be observed that the consumption and
aste of water in the District of Columbia for June 21, 1899, was
,079,855 gallons per diem. This is the largest June measurement ever

taken, and, estimating the present population of the District
there is obtained a daily per capita consumption and waste of 1

An examination of the hourly consumption and waste, as
the hourly measurement of June 21, 1899, shows that during
from 6 a. m. to 12 noon 14,729,195 gallons of water were cons
during the hours from 12 midnight to 6 a. m. a consumption o
gallons. The first period includes the hours of greatest co
and the latter the hours when the least demand is made on t
During this latter period, the hours of the night, there shoul
small demand for domestic purposes and certainly less fo
turing.

The consumption during the morning hours was 29 per
total, and during the night hours 19 per cent of the same.
words, the consumption at night was about two-thirds the co
when there was the greatest demand for all purposes.

The above statements show that there is a reckless was
certainly practiced in the District of Columbia.

As a rule any considerable leak in a main or service pipe,
connected with a sewer, soon betrays itself and is readil
Consequently the aggregate waste from this source is com
small. The evil is due principally to defective plumbing
waste.

During the periods of very cold weather the quantity of
for necessary domestic and public purposes is less than
experience obtained from observations of the level of the d
reservoir shows that the greatest consumption is during t
weather. This was the experience during 1899 as well as
The lowest recorded level at the distributing reservoir was
February 16, due to the severe weather at that time, the th
at the reservoir having recorded 13° F. below zero on Febru
4 below on February 15.

This lowering of the reservoir was undoubtedly caused by
the necessity for opening the tap being due to defective plu
improper house connections. No plumbing should be so a
house connection so made that any danger of freezing obtai

Careful and trustworthy investigations and measurement
various cities in the United States show clearly that a per c
consumption of 100 gallons is ample for all domestic, bu
public purposes, and that any considerable increase above t
must be attributed to waste, due to defective mains and ser
defective plumbing, and willful waste.

This extravagant use of water has become a serious men
supply of water by the Washington Aqueduct with its presen
The capacity of the Aqueduct, with a head of 146 feet at the
ing reservoir, a head necessary to keep up the present press
gravity supply, is 50,000,000 gallons per diem. If the level
tributing reservoir were lowered to 144 feet the ultimate sa
supply is 76,000,000 gallons. This latter involves a loss of
feet, so that to obtain the same pressure with the supply
pumping would be required.

The present daily consumption is 50,000,000 gallons, and
of increase per decade for the last ten years, 1889–1899,
gallons, it would reach the ultimate limit of 76,000,000 gallo
twelve years.

The present consumption and waste has also an importa
on the subject of filtration.

gress has called for a report on this subject and the matter is now going investigation. It is probable that the cost of filtration e about $6 per million gallons, or, at the present rate of consumpabout $300 per day or $110,000 annually. This is a large charge an only be reduced by a reduction in consumption.

existing conditions suggest two remedies—either the reduction isumption to a reasonable rate, 100 gallons per capita per diem, e increase of the present supply to keep up with the present sonable and extravagant demand of 178 gallons per capita per

first remedy, the reduction of consumption, can only be accomd by the introduction of meters. This is a positive and certain od and has been shown by actual experience to be perfectly feasi- However, whenever this subject of the introduction of meters een brought to the attention of Congress it has failed to meet val.

ot. Edward Burr, Corps of Engineers, U. S. A., when in charge water department of the District of Columbia, made an able xhaustive report on this subject. (See Report of the Commission- the District of Columbia for the fiscal year ending June 30, 1897, I, p. 181 et seq.)

otain Burr says (p. 189–191):

sumé of the above figures as to per capita use of water is—

	Gallons.
mestic purposes, 27, or, say	30
mmercial and United States purposes, 27, or, say	30
rinkling (maximum), 12, or, say	15
Total maximum legitimate use	75

for waste, not deliberate or willful, 25 gallons, and the total is 100 gallons per , or 28,000,000 gallons a day. With such an allowance and supply of water would be ample for all purposes—domestic, commercial, and public. There be no necessity for stinting or economy in any legitimate use of water. All necessary is the suppression of careless, deliberate, and willful waste, due to ive plumbing, known or unknown, and positive personal violations of regulan opening fixtures to allow water to run continuously.

e is but one means to fully control and suppress such waste—the general ion of the meter system to all classes of consumers, domestic as well as coml. Until this means is adopted periodical shortages in the water supply of ity must be expected, not because the supply of water is insufficient for all nate uses, but because 70 per cent of it is wasted and serves no good end ver.

t the general introduction of meters will accomplish this end without hardncreased cost to consumers, insanitary conditions, or any curtailment of the use of water there can be no doubt. The opinion of all authorities and the ence of all communities where the meter system has been generally introduced this belief. By the use of meters is obtained a suppression of waste, a uniy of water rates according to the amount of water used or wasted, and an se of pressure, with a general improvement of the service without the expendof large sums for enlargements of works.

llustrate the benefits of the meter system it is necessary to refer to but one Detroit, with about the same population as the District of Columbia. The folg quotations are taken from a statement made by Mr. L. N. Case, superintend the Detroit waterworks, before a committee of the legislature of the State chigan, having under consideration what is known as the "free-water bill" troit:

iere has been found but one really efficient restriction to waste, and that is the , although assessing upon the basis of consumption as estimated is partially

* *

or years and up to 1889 Detroit, Buffalo, and Philadelphia operated upon the ment plan entirely. Detroit pumped a daily per capita supply of 204 gallons. apacity was more than exhausted, and complaints of short supplies were bitter ncreasing. March 6, 1889, I demonstrated to the board that meters must be used to stop this enormous waste or an enlargement of the works entere diately at an estimated expense of $600,000.

"The introduction of meters was decided upon. The following cond three cities in 1887 and 1896 will show the results of the introduction Detroit and the continuance of the old method in Buffalo and Philadel

Daily pumpage, in million gallons.

	Buffalo.	Phila- ph
1887	88	
1896	101	
Increase in population ... per cent..	34	

"Detroit, at the same rate of increase of Buffalo and Philadelphia, sponded exactly with her increase previous to using meters, would h 101,000,000 gallons daily. This would have required an expenditure of for engines and pipes more than was expended, and an extra expense water of $94,900 for last year, with a proportionate increase for the years."

* * * * * *

One-third increased pressures!

The result in Detroit is a stationary total consumption for ten years, cent increase in population and a per capita decrease from 203 to 130 ga was accomplished by metering about 5,000 consumers of a total of 49,00 the effect is marked the per capita supply still shows large waste, that ca by increasing the number of meters.

In this city (Washington) the increase in the use of meters has produc but no less marked effect. The existing law requires the use of me hotels, livery stables, manufacturing establishments, and other large Since 1894 all such consumers have been required to use meters. The foll shows the result:

	1894.	1895.	1896.
Number of premises supplied	44,185	45,675	46,9
Number of meters	202	231	5
Water supplied ... gallons..	49,162,000	47,182,000	44,114,0
Per capita ... do....	181	178	1

With an increase since 1894 of 4,355 in the number of premises supplied the total daily supply is reduced by about 4,000,000 gallons and the pe ply from 181 to 164 gallons.

This can be attributed to no other cause than to the metering of abo consumers of the character mentioned above.

The introduction of meters will not prevent an abundant all purposes, will result in a less water rate or expense to and would throw the burden of waste where it belongs, on the of the careless and willfully negligent consumers.

The second remedy is an increase of the water supply to m demands at the present extravagant rate of consumption.

This involves the building of a second conduit from the G of the Potomac, with the necessary reservoirs, if any, and p houses and operating plant. In order that this subject may h consideration, with due deliberation and prevision, a survey cable routes is essential. These surveys should be taken i once, and an estimate for such surveys is submitted with thi

THE BY-CONDUIT AT THE DALECARLIA RESERVO

This by-conduit was constructed for the purpose of passing supply from the Great Falls around the Dalecarlia reserv ls when it might be necessary to empty this reservoir for pur- of cleaning, etc. In its present condition it is not available for nd is so weak as not to be water-tight. It requires strengthening ı some places complete rebuilding. It is an important part of the luct system and should be placed in a serviceable condition. An ate for this work is submitted.

uitable storehouse and stable should be erected at Great Falls for orage of tools and implements and the stabling of the watchman's s, which horses are a necessity to the watchman for the proper mance of his duties. For this an estimate is submitted.

tection of the inlet to the conduit at Great Falls.—The bank of the ıpeake and Ohio Canal, which runs parallel to the Potomac at Falls and about 150 feet from it, is about 14 feet higher than ncovered chamber just above the Maryland end of the Aqueduct that forms the inlet from the river to the conduit. In the flood of nber, 1877, which rose at Great Falls to the height of 160 feet the datum of the Aqueduct, or 12 feet higher than the crest of the the canal bank at a point opposite the inlet was washed down to iver and a part of it into the inlet. To quote from the annual t of the Aqueduct for 1878:

> masonry forming the arch of the feeder was uncovered from a point near the of the canal to the mouth of the feeder, a distance of 150 feet. The chamber head of the Aqueduct was filled with stones that had formed the slope wall of ıal, and the Aqueduct feeder for a distance of 300 feet was filled with débris ths varying from 3 to 6 feet, so as to entirely stop the flow of water during the ry low stages of the river.

the still higher flood of June, 1889, which rose to the height of 16 ver the Aqueduct Dam, the canal bank was again washed down e river, but fortunately the damage did not occur immediately ite the inlet to the conduit, but from 200 to 400 feet higher up, so he major part of the débris being left on the margin of the river part of it being carried over the dam, not so much filling of the to the conduit was done, but, as in the flood of 1877, it was par- obstructed.

annual report of the Aqueduct for 1889 says:

> banks of the Chesapeake and Ohio Canal above and below the mouth of the t were carried away and that opposite the conduit was threatened. A num- men were kept at work on this bank during the freshet; and it is believed ad it not been for the energetic work of this force and the widening and thening of the bank at this locality in April great damage would have occurred mouth of the conduit.

vill be observed that in the freshet of 1877 not only the inlet ber, but the conduit itself, was filled with débris to a depth of from feet for a distance of 300 feet in from its mouth, but, the water in ver being at a high stage, there was still waterway enough in the it above the débris to enable the supply to the city to be kept up. a complete closure of the mouth of the conduit occurred, with 12 feet of water over it, there would have been no possible way, with rrent raging over the mouth, to remove the obstruction before ver subsided, and the water supply to the city would have been f.

re is no more important part of our system of water supply to be lly guarded than the head of the conduit at Great Falls, and in to avert dangers like those of 1877 and 1889, to which the water y is liable at every freshet, a masonry wall should be built between iver and the canal rising a few feet higher than the latter and ding upriver from the mouth of the conduit as far as the limit of

the Government land, and thence, at about a right angle a
the Government land, to the shore of the river.

An estimate is submitted for the protection of the inlet t
duit at Great Falls at a cost of $5,000.

ESTIMATES.

The estimates of appropriations that should be made fo
ending June 30, 1901, are as follows:

For repairing the by-conduit, Dalecarlia Reservoir.....................
For building combined storehouse and stable at Great Falls...........
For protection of the inlet to the conduit at Great Falls ....
For preliminary surveys for additional conduit from Great Falls ....
For operation, maintenance, repair, etc., of the aqueduct and its acce
sories, including the Conduit road ....

Total...

Money statements.

WASHINGTON AQUEDUCT.

Amount appropriated by act approved June 30, 1898......................
June 30, 1899, amount expended during fiscal year.......................

July 1, 1899, balance unexpended...
July 1, 1899, outstanding liabilities.......................................

Amount that can be profitably expended in fiscal year ending Ju
30, 1901..

WASHINGTON AQUEDUCT, D. C., 1899—REPAIRING CONDUIT RO

Amount appropriated by act approved June 30, 1898......................
June 30, 1899, amount expended during fiscal year.......................

Appropriations made for the Washington Aqueduct, with the dates of acts

Date.	Amount.	Date.	Amount.	Date.
September 30, 1850...	$500	June 10, 1872	$70,555	March 3, 1887....
August 31, 1852 *a*....	5,000	January 23, 1873....	14,000	July 18, 1888 *h* ...
March 3, 1853........	100,000	March 3, 1873 *c*	43,600	March 2, 1889 *i*...
March 3, 1855........	250,000	June 23, 1874 *d*......	36,400	August 6, 1890 *j* .
August 18, 1856......	250,000	March 3, 1875.......	26,000	March 3, 1891 *k* ..
March 3, 1857........	1,000,000	July 31, 1876........	22,000	July 14, 1892.....
June 12, 1858	800,000	March 3, 1877.......	15,000	March 3, 1893....
June 25, 1860	500,000	June 20, 1878	15,000	August 7, 1894 *m*
July 4, 1864..........	150,000	March 3, 1879 *e*	20,000	March 2, 1895 *n*..
July 28, 1866.........	142,584	June 4, 1880 *f*	20,000	June 11, 1896 *o* ...
December 20, 1866 ..	12,000	March 3, 1881.......	20,000	March 3, 1897 *p* ..
March 2, 1867........	20,000	July 1, 1882 *g*	20,000	June 30, 1898 ....
July 25, 1868.........	52,500	March 3, 1883.......	20,000	
March 3, 1869........	25,000	July 5, 1884.........	20,000	Total ......
July 15, 1870 *b*	120,822	February 25, 1885...	20,000	
March 3, 1871........	114,196	July 9, 1886.........	20,000	

NOTE.—Reverted to the Treasury: (*a*) $2.81, (*b*) $46.25, (*c*) $560.87, (*d*) 35 cents, (*e*) $1,10
(*g*) $1.354,17, (*h*) $2,266.34, (*i*) $4.12, (*j*) $5,500, (*k*) $2.49, (*m*) $39.96, (*n*) $2,983.87, (*o*) $285.
$4.38 from regular appropriation for Washington Aqueduct, and $1,824.15 from appro
structing telephone line; total, $16,366.54. Since 1878 one-half of the amounts approp
contributed by the United States and the other half by the District of Columbia.

APPENDIX 1.

CONDITION OF THE WATER DURING THE YEAR.

tion of water at Great Falls, Dalecarlia Reservoir, and distributing reservoir, and height of water over dam at Great Falls for each day in the year.

Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).
Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.	
July, 1898.				August, 1898.				September, 1898.				October, 1898.			
36	36	36	.60	13	24	29	.90	30	36	36	.80	36	36	36	.60
36	36	36	.60	15	32	30	.90	36	36	36	.80	36	36	36	.60
36	36	36	.60	7	36	36	.90	36	36	36	.70	36	36	36	.60
36	36	36	.60	12	33	36	.80	36	36	36	.70	36	36	36	.60
36	36	36	.60	1	27	36	.90	36	36	36	.70	36	36	36	.60
36	36	36	.60	1	5	36	1.30	36	36	36	.70	36	36	36	.60
36	36	36	.60	1	3	36	2.20	36	36	36	.70	36	36	36	.70
36	36	36	.60	1	2	23	1.70	36	36	36	.70	36	36	36	.70
36	36	36	.60	1	1	12	1.40	36	36	36	.70	36	36	36	.70
36	36	36	.50	1	2	8	1.60	36	36	36	.70	36	36	36	.70
36	36	36	.50	1	1	5	2.50	36	36	36	.60	36	36	36	.70
36	36	36	.50	1	2	4	4.60	36	35	36	.60	36	36	36	.70
36	36	36	.50	1	1	2	3.60	36	36	36	.60	36	36	36	.70
36	36	36	.50	1	1	2	2.40	36	36	36	.60	36	36	36	.70
36	36	36	.50	1	1	2	2.10	36	36	36	.60	36	36	36	.70
36	36	36	.50	1	2	2	1.70	36	36	36	.60	36	36	36	.70
36	36	36	.50	2	3	2	1.60	36	36	36	.60	36	36	36	.70
20	36	36	.50	4	2	3	1.50	36	36	36	.60	36	36	36	.70
16	36	36	.50	4	4	3	1.50	36	36	36	.60	7	36	36	.90
1	18	36	.50	2	4	2	1.50	36	36	36	.70	1	36	36	2.20
16	11	36	.50	1	1	3	1.40	36	36	36	.60	1	10	36	2.30
8	5	36	.50	2	1	3	1.40	36	36	36	.60	1	3	36	2.10
12	14	36	.50	2	2	3	1.30	36	36	36	.60	1	2	27	3.30
22	21	32	.50	6	3	3	1.10	29	36	36	.60	1	2	13	3.80
30	24	32	.50	8	4	3	1.00	36	36	36	.60	1	1	5	2.50
36	36	36	.50	7	16	5	.90	36	36	36	.60	1	2	4	1.90
1	36	36	.50	11	10	10	.90	36	36	36	.60	2	3	3	1.70
1	36	36	.60	13	9	13	.90	36	36	36	.70	3	3	3	1.60
4	11	36	.60	24	10	15	.80	36	36	36	.70	4	4	3	1.60
17	5	36	.50	25	22	19	.80	36	36	36	.60	6	5	4	1.50
4	11	29	.80	28	36	30	.80	....	......	......	......	7	6	7	1.50

Condition of water at Great Falls, Dalecarlia reservoir, etc.—Cont

Day of month.	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Cond
	Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gate-house.		Great Falls.
	November, 1898.				December, 1898.				January, 1899.				Fe
1	10	9	11	1.50	21	29	36	1.30	6	8	8	1.50	8
2	13	8	14	1.40	32	36	36	1.30	8	12	12	1.50	19
3	19	11	14	1.40	29	36	36	1.30	7	9	16	1.40	24
4	23	17	16	1.30	9	36	36	1.30	8	6	16	1.40	36
5	28	20	20	1.20	1	36	36	2.50	3	4	12	1.60	36
6	29	25	32	1.10	1	29	36	3.30	1	7	11	1.90	26
7	30	30	31	1.10	1	3	25	2.70	1	9	15	2.90	29
8	28	33	36	1.10	1	1	14	2.20	1	5	15	2.90	31
9	30	36	36	1.10	4	2	4	1.80	2	3	14	2.70	34
10	30	36	36	1.10	6	3	3	1.60	5	3	14	2.30	35
11	5	36	36	1.20	6	5	4	1.50	10	3	5	2.10	36
12	3	36	30	1.30	10	7	4	1.40	12	4	4	1.80	36
13	1	10	36	1.20	22	10	3	1.30	7	5	4	1.70	36
14	3	5	36	1.20	32	15	4	1.20	16	7	4	1.60	36
15	5	2	25	1.20	22	23	5	1.00	20	10	7	1.60	36
16	12	5	19	1.10	32	28	8	1.00	18	12	8	1.70	36
17	14	13	13	1.10	34	32	9	.90	10	10	10	2.20	36
18	11	10	18	1.20	34	34	12	1.00	7	14	10	2.10	36
19	1	14	21	1.50	36	36	17	1.10	8	16	12	2.00	33
20	3	17	21	1.60	10	36	19	1.20	10	18	18	1.90	13
21	3	9	25	1.60	4	29	23	1.50	13	7	20	1.80	6
22	5	4	34	1.70	2	19	25	1.50	23	16	21	1.80	3
23	7	2	21	1.60	1	8	22	1.90	28	16	21	1.70	1
24	9	6	17	1.60	1	3	19	2.40	32	20	22	1.50	1
25	11	9	19	1.50	2	2	13	2.50	1	19	25	1.70	1
26	11	13	20	1.50	4	2	10	2.30	1	25	25	1.80	1
27	12	18	21	1.50	4	3	8	2.10	2	5	22	2.00	1
28	10	25	28	1.40	6	4	5	1.90	3	3	12	1.80	1
29	22	28	36	1.30	23	7	4	1.70	3	2	8	1.80	....
30	22	19	36	1.30	23	7	4	1.50	6	2	5	1.50	....
31	....	......	......	......	12	7	6	1.50	6	6	4	1.40	....

Condition of water at Great Falls, Dalecarlia reservoir, etc.—Continued.

Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).	Condition of water.			Height of water over dam at Great Falls (feet).
Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gatehouse.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gatehouse.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gatehouse.		Great Falls.	Dalecarlia receiving reservoir, south connection.	Distributing reservoir, effluent gatehouse.	
March, 1899.				April, 1899.				May, 1899.				June, 1899.			
1	3	5	3.90	4	11	11	2.20	36	36	36	1.00	1	36	30	1.00
1	2	4	3.30	4	3	8	1.90	36	36	36	1.00	1	17	36	1.00
1	3	4	2.90	11	4	5	1.80	36	36	36	.90	1	6	27	1.50
2	2	4	2.80	14	4	5	1.70	36	36	36	1.00	1	3	22	1.30
1	2	4	3.20	32	7	5	1.50	7	36	36	1.00	1	3	11	1.10
1	4	4	4.10	34	10	6	1.50	3	36	36	1.00	1	1	5	1.00
1	2	4	4.90	36	13	7	1.40	19	29	36	1.00	1	2	5	1.00
1	1	4	3.40	1	21	10	1.50	18	32	36	1.10	1	2	3	.90
2	1	3	2.80	1	26	15	1.70	2	26	36	1.10	2	2	3	.90
4	2	2	2.40	2	11	15	1.90	5	24	30	1.20	1	3	3	1.00
6	3	2	2.30	6	6	15	1.80	3	13	36	2.00	1	4	3	1.00
8	4	2	2.20	9	4	13	1.70	3	10	30	1.80	1	2	3	1.00
5	3	2	2.20	21	8	13	1.60	5	8	36	1.50	1	2	3	1.00
8	3	3	2.10	27	13	10	1.50	8	5	29	1.50	2	3	3	1.00
8	5	4	2.00	27	19	13	1.40	13	8	27	1.40	2	3	3	1.00
5	7	4	2.00	25	24	17	1.30	23	14	25	1.30	3	5	3	.90
3	7	5	2.00	10	27	17	1.30	12	19	23	1.20	4	5	3	.90
3	4	6	1.90	32	22	22	1.20	2	27	21	1.20	9	7	4	.90
4	4	6	1.90	34	27	27	1.20	1	14	20	1.40	14	8	7	.90
1	4	6	2.10	36	30	30	1 20	1	.5	19	2.90	18	12	8	.90
1	5	7	2.10	36	36	36	1.20	1	3	13	2.20	21	18	13	.80
1	3	7	2.00	36	36	36	1.20	1	2	8	1.70	29	24	16	.80
2	3	5	2.00	36	36	36	1.10	4	2	6	1.50	30	22	20	.80
2	2	4	1.90	36	36	36	1.10	8	3	4	1.30	33	24	27	.70
6	4	6	1.80	36	36	36	1.10	15	5	5	1.20	35	30	36	.70
13	5	6	1.60	36	36	36	1.00	22	6	6	1.10	35	32	36	.70
14	7	8	1.60	36	36	36	1.00	24	13	6	1.10	36	36	36	.70
26	9	9	1.50	36	36	36	1.00	33	22	7	1.00	36	36	36	.80
3	17	12	1.90	36	36	36	1.00	36	30	12	1.00	36	36	36	.70
1	12	15	2.90	36	36	36	1.00	36	36	18	.90	36	36	36	.70
2	6	14	2.70	....	......	......	......	36	36	26	.90	....	......	......	......

ording to the scale for recording the condition of the water as regards clear- the numbers 0 to 7, inclusive, correspond to very turbid; 8 to 14, turbid; 15 to ightly turbid, and 22 to 36, clear. The following table shows the condition of ater at various parts of the system during the year:

Condition.	Number of days when this condition existed at—		
	Great Falls.	Dalecarlia reservoir, effluent gatehouse.	Distributing reservoir, effluent gatehouse.
urbid	151	136	97
l	46	42	47
y turbid	17	25	41
	151	162	180
Total	365	365	365

Daily gauge pressures at the office of the Washington Aqueduct at 9 o'clock a. m.

Month.	Main.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Average.
1898.	*Inch.*																																
July	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	35	35	35	35	35	36	36	36	36	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35.12
August	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	35	35	35	35	35	35	35	35	35	35	35	35	36	36	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35.06
September	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	....	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	....	31
	48	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	....	35
October	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	37	36	35.19
November	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	....	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	....	31
	48	36	36	35	35	36	36	35	35	35	35	35	35	36	36	35	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	....	35.70
December	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	36	35	36	36	36	36	36	35	35	35	35	35	35.64
1899.																																	
January	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	35	35	34	35	35	35	35	35	35	35	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	34.93
February	30	30	30	30	30	30	30	30	30	30	Gauge pipes frozen.													30	30	30	30	30	30	....	....	....	30
	36	31	31	31	31	31	31	31	31	31	Gauge pipes frozen.												31	31	31	31	31	31	31	....	....	....	31
	48	35	35	35	35	35	35	35	35	34	33	33	33	33	33	33	33	34	34	34	34	34	34	34	35	35	35	35	35	....	....	....	34.21
March	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	36	36	37	36	36	36	36	36	36	36	36	36	36	36	36	35.61
April	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	....	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	....	31
	48	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	36	36	....	35.86
May	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	36	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	48	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35.51
	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	....	30

B B B 2.

NCREASING THE WATER SUPPLY OF WASHINGTON, DISTRICT OF COLUMBIA.

is work is being prosecuted under an act making appropriations to ide for the expenses of the government of the District of Columbia he fiscal year ending June 30, 1899, and for other purposes, roved June 30, 1898.

ie clause of this act making appropriations for this work is as ws:

> shington Aqueduct Tunnel: The Secretary of War is hereby authorized and ted to resume work on the Washington Aqueduct Tunnel and its accessories he Howard University Reservoir, authorized by section two of the act approved fifteenth, eighteen hundred and eighty-two, entitled "An act to increase the supply of the city of Washington, and for other purposes," and to prosecute omplete the same; the work on the said tunnel and accessories to be carried on ordance with the plans of the board of experts as set forth in its report, dated ry seventeenth, eighteen hundred and ninety-six, House Document numbered undred and sixty-six, Fifty-fourth Congress, first session, which plans have been ved by the Chief of Engineers and the Secretary of War. And to carry out rovisions of said act and this paragraph, the balance remaining unexpended the appropriations made by the said act of July fifteenth, eighteen hundred ighty-two, and by subsequent acts for said purpose, amounting to two hundred inety-seven thousand two hundred and ten dollars and fifty cents, is hereby ropriated, to be advanced out of the revenues of the United States, and not ct to the conditions of the capital account created by the act of July fifteenth, een hundred and eighty-two, and the sum of two hundred and ninety-seven and two hundred and ten dollars and fifty cents is also hereby appropriated out e surplus general revenues of the District of Columbia, to be applied to such of the work and in such order as to time as the Secretary of War may deem sary to promote as soon as practicable the completion of the entire system of works: *Provided*, That the sums herein set apart and appropriated shall be diately available and shall be expended under the direction of the Secretary of and the supervision of the Chief of Engineers; and the work shall be carried on ntract or otherwise, as the Secretary of War may deem best for the public est.

e work is to be carried on, in compliance with the above act, "in rdance with the plans of the Board of experts as set forth in its rt, dated January 17, 1896."

at portion of the report referred to which contains the plans of the d of experts is as follows:

PERCOLATION.

of the objections against the tunnel that has been urged with much force is ability of leakage or percolation outward from the tunnel into the ground it is subjected to the pressure of the water. This is a point to which we have ed much time and attention. It is evident that should the leakage be suffi- y great the dangers to be apprehended from this source might be considerable. possible dangers, however, are materially lessened by a consideration of the hat from all the information we have been able to collect, it appears that for siderable portion of the tunnel the natural level of the water in the ground is r different from that of the hydraulic grade line of the water in the tunnel.

ce this tunnel was abandoned the new Croton Aqueduct, supplying the city of York with water, has been completed. A portion of this aqueduct, embracing gth of about 7 miles, is subjected to internal pressure with a maximum pressure a head of about 130 feet. In this case no serious percolation has been observed, ugh the surface of the ground is at several points much below the hydraulic line. An experiment made for the purpose of determining the amount of this ge outward from the aqueduct showed that the total loss in the whole 7 miles this cause did not exceed 225,000 gallons in twenty-four hours.

th this practical example before the commission, and guided by our own judg- and experience, we believe that if the spaces now existing between the brick- and the rock are thoroughly filled with rubble masonry and grouted, that the tunnel can be made sufficiently watertight, and that the leakage unde 150 feet will not be large enough to prove an obstacle in the way of the completion and operation of the tunnel. In this connection we recomme interior surface of the whole tunnel should receive a double coating or w Portland cement. This treatment will aid materially in making the brick impervious to the passage of water.

Objection has also been urged against the tunnel on the ground of th contamination to the supply from the percolation of ground water into when it is empty. This condition can occur but seldom, perhaps but on a year at the most, when the tunnel is pumped out for examination. The this percolation is very slight, even under present conditions with the lin cally open. While our examinations of the tunnel were under way sampl at various points were collected for analysis, and not without some d account of the small amount of water flowing. These analyses do not in anything of a contaminating nature passes into the tunnel when it is em

If the tunnel is completed in accordance with our recommendations, t tion will be so trifling as to be unimportant, especially when taken in with the general absence of organic matter in the wells of those portions which are much more thickly populated than is the ground directly over

SILTING.

It is known that at times the Potomac water contains a large amount c idea of the amount which may be expected to deposit in the tunnel may from the results of sedimentation which has taken place in the past in aqueduct, where it has not been the source of serious trouble. If the occur they should not be allowed to accumulate, but should be remove to time, and this can be readily done by means of the four shafts retained will be equipped with the necessary hoisting machinery to accomplish

COMPLETION OF THE MAIN TUNNEL.

A portion of the tunnel about 6,000 feet in length now contains no lini remainder is provided with a lining of varying section, as shown on one of panying plates. Our estimate for the completion of the tunnel proper i naturally divided into two parts.

We have estimated for completing the unlined portions of the tunnel work of the same form as that used in the lined portions which are provid invert. There are large quantities of loose rock in the tunnel at these po can be used for the rubble-masonry backing.

Our examination of those portions of the tunnel already lined, taken in with the published testimony and supplemented by the statements of ot we have called before us, shows that there is a great diversity in the c the lining. In some portions of the tunnel vertical rubble side walls built. Where these occur we have been unable to find any void spaces of behind the walls. In other cases the side walls are built of brick, gene on the outside to the crown of the arch with loose packing. Some porti a brick invert. As a general rule, empty spaces exist over the crown of th the westerly part of the tunnel these spaces are comparatively small, easterly portion they are much larger, in some cases extending to more in height. These cavities must be filled with rubble masonry laid solidl mortar. In some cases timbering exists in the spaces over the arch. The should be taken out in sections and rubble masonry substituted. Where will not allow of laying rubble masonry provision has been made for spaces with stone packed by hand and then grouting the whole mass w under pressure. In other words, it is intended to fill every space or void ing in these portions of the tunnel either with cement, grouted rubble, or masonry laid in cement, thus securing a solid backing everywhere betwee and the rock.

Where no invert now exists we recommend a slight excavation of the r building of an invert of Portland cement concrete, smoothly finished.

REENFORCEMENT OF THE ROCK CREEK SECTION.

Experiments made by Major Knight in 1895, and detailed in his repor subject, indicate that the covering of rock over the tunnel in the Rock C is not sufficient to provide the necessary resistances required, or to prev percolation. These experiments confirm our own opinion that for a lengt 1,000 feet under Rock Creek it will be necessary to provide some special f struction. We have considered various plans, and have come to the conc a subtunnel, built at a considerable distance below the present tunnel, should vided, or that the present tunnel should be lined with cast iron, surrounded ncrete. A majority of the commission is inclined toward the metallic lining. st of the two plans is practically the same.

ACCESSORIES.

e course of our examination we have found that it will be necessary to pro- veral accessories in connection with the tunnel for the purpose of making it le and for the purpose of maintaining it in a proper manner after construc- completed. We will now allude to these briefly in their order, beginning at sterly end.

nnection now exists with the 7-foot by-conduit around the distributing reser- A direct connection should also be made with the reservoir, near the westerly o be controlled by a gatehouse, provided with the necessary gates and appli- o regulate the flow.

is probable that there are voids existing between the brick lining and the urrounding the westerly shaft, the whole of this shaft should be thoroughly d.

estimate has included a gatehouse covering the shaft, which will contain g apparatus of simple construction for the raising of material from the bottom tunnel. The shaft is to be provided with a deep sump protected by heavy .

profile of the tunnel shows a slight summit near the westerly end, and we have ed a small brick structure through this divide for the purpose of draining the in an easterly direction.

have deemed it advisable to close the Foundry Branch shaft entirely. This ly be accomplished by providing drainage through the Fayette street summit easterly direction to the Rock Creek shaft. We recommend the construction h this summit of a 24-inch masonry pipe properly protected with concrete. to slight percolation in the immediate neighborhood of the Foundry Branch the brick lining at this point is to be reenforced, the shaft lined, grouted, and nently sealed.

hree of the air shafts existing on the line of the tunnel are to be repaired, d, and protected by suitable coverings.

e Rock Creek portion is the lowest level in the tunnel, and there is here but amount of material over the arch, this point has been selected for the con- on of a 48-inch blow-off, with gates, to empty the tunnel of all the water which taken out, with the exception of that which must be pumped. The shaft is rovided with a metal lining 6 feet in diameter, backed with brick and con- To this lining will be attached a cover of sufficient strength to resist the l pressure. The shaft will be protected by a brick house provided with g apparatus. A short distance from the shaft an excavation will be made in k to receive a large pump pit surrounded with a heavy wall and containing nping machinery, the whole covered by a substantial superstructure. A boiler will contain the necessary boilers for supplying power to the pumps, which of sufficient capacity to raise 12,000,000 gallons in twenty-four hours from el of the tunnel to Rock Creek.

e Champlain Avenue shaft the present timbering is to be repaired and the ined with brick and concrete, containing an opening not less than 8 feet in er. A standpipe 25 feet in height should be built upon the top of the shaft, e whole covered with a brick house containing the pumping and hoisting ery. A connection with the local sewer should be made at this point, to avoid charge of water onto the surface of the ground.

Howard or easterly shaft is to be reenforced by a 12-inch brick lining inside sent shaft, and the backing of the shaft grouted throughout its whole height. will be a paved sump at the bottom.

eral sum has been estimated for the erection of a gatehouse over the easterly it is an important adjunct in connection with the construction of the tunnel. ndation of the gatehouse is to be independent of the shaft and sunk to a rable depth, not less than 50 feet below high water in the reservoir. The use will be large enough to control the flow of water to different parts of the ir, and double sets of gates will be provided for this purpose. It will also the effluent water from the reservoir and discharge it into the large cast-iron lready laid from the reservoir and connecting with the distribution system.

ESTIMATES.

following table contains estimates for completing the different portions of the above alluded to. The estimates include what we deem to be a sufficient nce for superintendence and contingencies. The total amounts to $897,837.

In our judgment the tunnel can be completed in a first-class manner, w sories, and ready for operation, for the above sum.

For completing the unlined portion of the tunnel.......................
For completing the portions already lined ....
Reenforcement of tunnel at Rock Creek ....

Total to complete tunnel proper..................................
Appurtenances, including shafts, connections, gatehouses, machinery,
Miscellaneous, including cleaning and coating tunnel and pumping du
construction, etc...

Total ....

The quantities on which we have based the above estimates have be Senate Report No. 2686, part 1, Fiftieth Congress, second session, an quent computations made under our direction by Capt. C. McD. Town Engineers, U. S. Army, whose services were kindly placed by you at also upon the supposition that the whole work will be completed inspection and superintendence within two years.

ADDITIONAL CONSIDERATIONS.

We desire to emphasize the importance of providing proper detail the construction of the tunnel and all the appliances necessary for and briefly described above.

In connection with the various pumping plants, which from the p of the tunnel it is necessary to maintain at various points, we have recommendations to make: A selection of men should be made from t force employed upon the maintenance of the completed system. The be drilled in the operation of all the machinery connected with the them for working the pumps promptly whenever it becomes necessary the maintenance of all the machinery in good order.

Our instructions do not direct any consideration of the constructio of the reservoir near the Howard University nor its outlets into th system; we have, therefore, confined ourselves to a study of the tun its appurtenances. Realizing, however, that the tunnel and the part of one harmonious system and realizing the magnitude of the int ing upon the security of these works, we recommend that the most nation should be made both of the reservoir and of the connect distributing system before the tunnel is put into service.

The work recommended by the Board of experts ma classified as follows:

(1) Lining the unlined portion of the tunnel with bri including invert, and backing same with rubble masonry o

(2) Constructing an invert in portions of lined tunnel was originally built.

(3) Repairing the defective lining already built by re timber and loose stone backing and replacing it with rub or concrete, or grouting where necessary.

(4) Arranging the drainage of the tunnel west of Rock so that all drainage may be collected at the Rock Creek sh

(5) Lining the portion of the tunnel in the vicinity of shaft with iron, finished on the interior with brick masonr

(6) Filling the voids in backing, where dry rubble w grouting same.

(7) Constructing the necessary accessories, including blow-off at Rock Creek, air shafts, etc.

(8) In addition to the above, specially mentioned by t experts, the preparation of the Howard University Reser reception of water and the laying of the mains necessary fo the supply.

PRELIMINARY WORK.

PUMPING OUT TUNNEL, ERECTION OF PLANT, AND PREPARING TUNNEL FOR LINING.

paration for pumping out the tunnel and placing the shafts in ng order was begun July 15, 1898. Temporary plants, consisting ricks and hoisting machinery and pumps, were set up at Foundry h, Rock Creek, Champlain Avenue, and Howard University shafts, y September 1 the following work had been completed:

ndry Branch.—The brick and cement seal placed in the shaft dure test in 1896 had been removed, two Cameron pumps hung, and am and water connections made.

k Creek shaft.—The shaft was retimbered to a depth of 14 feet he surface to the water level, two pumps hung, and steam and connections made.

mplain Avenue shaft.—The concrete seal was removed, shaft retim- 76 feet to water level, one pump hung, and steam and water ctions made.

vard University shaft.—The cage timbers and guides were placed to level, 112 feet below the top of the shaft, two pumps hung, steam vater connections made, and head house built over shaft.

nping began at Foundry Branch shaft on September 1 and at all shafts by September 13, and the tunnel was ready for underground tions on September 30.

following table shows the amount pumped and the time required h shaft:

Shaft.	Number of pumps.	Began.	Completed.	Time required, days.	Gallons pumped.
y Branch	1	1	5	5	1, 691, 539
eek	2	8	29	21	16, 712, 222
in Avenue	1	8	21	13	4, 372, 326
University	2	13	21	8	4, 286, 951
tal					27, 063, 038

nping has since continued and the daily amount required to keep nnel dry and in good working order is as follows:

	Gallons
ry Branch shaft	90, 201
Creek shaft	510, 105
lain Avenue shaft	42, 163
d University shaft	143, 078
Total	785, 547

soon as each shaft was pumped out working parties began the of removing muck and laying track preparatory to trimming the l where the necessary cross-section was incomplete and removing one already blasted down and still left in the tunnel.

December 1 all the temporary plant was removed, the timbering shafts completed, the permanent plant, consisting of head houses, , hoisting engines, boilers, buildings and machinery, blacksmiths' , carpenter shops, storehouses, railroad tracks, cars, and water installed.

work of preparing the tunnel for lining was pushed forward ly, and masonry work was begun in March, 1899.

1. *Lining unlined portions of tunnel.*—Bids were opened o
26, 1899, for furnishing sand, cement, brick, special castings,
and work on the concrete foundations for side walls and inv
March 23. Brick masonry of side walls and arch was begun
24 at Champlain avenue east, Station 24. Masonry work o
tion of the tunnel was continued until June 30, 1899, and 6
lining were completed, arch, side walls, and invert, and 341 f
wall and invert were completed ready for the arch. When
is completed the tunnel between Champlain avenue and How
will have been lined, except in a part of the old work. The
built at Foundry Branch, west, was as follows: Work began A
the concrete foundation for invert and side walls; brick
started April 25 and 146 feet of arch, side wall, and invert c
In addition, 310 feet of side wall and 340 feet of invert were

2. *Construction of invert in part of tunnel formerly lined.*—
plain avenue, east, the invert was completed from Station 198
Station 1547, east, a total length of 442 feet.

3. *Repairing the defective lining.*—This work was done in C
avenue, west, where the largest voids were found above the a
lining. These voids varied from 15 to 30 feet in length and
23 feet in height, and averaged 16 feet in width at the springi
the arch. The débris consisting of timbers, cord wood, and l
and fallen roof, was removed and carefully replaced by sol
masonry. This work was in two localities—from Station 106
760, west, and from 1319, west, to 1465, west, a total length o
In repairing this work 1,573 cubic yards of rubble masonry
64½ cords of timber and cord wood removed, and 261 cubic yard
taken out. This work is now perfectly solid and as soun
construction.

4. *Arranging drainage of tunnel west of Rock Creek.*—In th
the board a brick conduit having the proper slope is suggest
purpose of carrying the drainage to the Rock Creek sum
investigation it was found that the better plan would be a lo
the level of the bottom of the tunnel or invert to this requi
The difficulties and expense of blasting a trench and buildi
conduit would be more than the work and expense of low
grade of the bottom to a proper slope.

The work of lowering the bottom of the tunnel to grade
Foundry Branch and Rock Creek was begun on March 10,
continued up to the close of the fiscal year. At the highes
the excavation was as much as 8 feet, and from this to 0 as
grade. The work was begun at both ends—Station 30, Ro
west, and Station 0, Foundry Branch—the distance between
ties being 3,427 feet. Nine thousand nine hundred and 52 cu
of rock and muck were removed, and 2,812 linear feet of gra
pleted, leaving 615 linear feet to finish the cutting.

5. *Iron lining of tunnel at Rock Creek.*—Bids were opened f
ing the castings and bolts for this work on January 26, 189
May 16 the work of placing this lining was begun. The li
sists of cast-iron cylinders 9 feet in diameter in the clear.
ings are in segments 4 feet long in the direction of the a
cylinder, and of such dimensions that each forms a vousso
eighth the cylinder. The voussoirs, when bolted togethe
cylindrical ring 4 feet in length. These voussoirs are flang
inside and bolted to their true bearings, the joints, both r
vertical, being tooled to a perfect bearing. The thickness of

nches; depth of flanges on the inside, 3¾ inches, with a thickness
inches. These plates are bolted together horizontally and longi-
lly with 1-inch bolts. The castings furnished show great accu-
n their casting and tooling, as demonstrated by their perfect fit
ce. The lining is set up in rings 4 feet in length, using eight
gs for a length, and is backed, when possible, with carefully laid
e and concrete.

work began at Station 0 + 60, Rock Creek, west, and was con-
l west toward the point where the large water flow came through
of of the tunnel from Rock Creek. The tight rubble masonry
arried up to the point beyond which masonry could not be laid,
to the rapid flow of water. This flow came through the roof
pally in one large stream, falling clear of the sides of the tunnel,
mounting to about 425,000 gallons per diem. At high stages of
Creek this amount was nearly doubled.

rubble masonry backing was carried solid beyond this flow on
de of the lining opposite the stream flowing in from Rock Creek,
he portion on the side of flow for a length of 3 rings, or 12 feet,
arefully packed with dry rubble, then the solid rubble masonry
esumed as packing, confining the water to a space about 12 feet
nd 8 feet wide. Holes were drilled in the plates in this area to
the escape of the water. These holes are five in number—three
drilled for 2½-inch vent pipes and two for 1½-inch pipes. These
will be used as openings through which grouting will be pumped
he voids in the dry packing against the pressure of the water
Rock Creek. About 30 feet beyond this leak another weeper, or
1½ inches in diameter, is also drilled for the collection of some
seepage. This will also be grouted.

er passing the leak the lining as above mentioned is solidly backed
ubble masonry, the brick lining of the tunnel having been torn
insure solid packing.

total length of iron linings set up was 100 feet completed and
d. For backing, 159 cubic yards of masonry was laid, all of
is solid rubble except about 12 or 15 cubic yards of dry stone in
cinity of the vent holes.

illing voids in dry-rubble backing.—No work has actually been
nder this head, as it is deemed best to leave this until the por-
o be worked is entirely free from other active operations. This
and the washing of the interior of the tunnel with two coats of
t will complete the underground work.

experiment, however, was made with a view to testing the effi-
of grouting. A model was built 20 feet long to represent dry
packing of the tunnel. Timber lagging represented the extrados
brick lining and also the roof and sides of the rock excavation
e tunnel. Grout, consisting of one part hydraulic cement and
sand, with water enough to render the mixture of proper fluidity
s the grouting pump, was pumped into the dry rubble packing of
odel through auger holes bored in the interior. The cubic con-
of the dry rubble was 67 yards, and the voids by rough measure-
in water amounted to 50 per cent or 33½ cubic yards.

grout was applied until the voids were filled, as indicated by
ow. There were 75 barrels of cement, 150 barrels of sand, and
roper proportion of water used. The experiment was made in
unfavorable weather, December, 1898, and during the pumping
ermometer fell below the freezing point. The lagging was stripped
the structure March 1, and the voids were found completely filled,

the structure standing perfectly as a monolith. Photogra the result of this experiment are submitted with this repor clusion from the experiment is that the grouting can be s accomplished.

7. *Accessory works.*—These include the necessary gat shafts, and plant for emptying the tunnel for the purpose cleaning. Studies and working drawings are being ma works, to be in readiness for actual work at the proper tim

8. *Howard Reservoir.*—The Board of experts in their re mention this work incidentally, as they were not called o this matter.

The reservoir at present is in the same condition as whe was discontinued in 1888.

The revetment of the banks was never carried to the b reservoir along its whole perimeter. As this is a necessar in any case, authority was granted and advertisements we inviting bids for furnishing the stone to do this work.

If filtration is decided on it is probable that some altera tional work will be required on the reservoir. A project will be submitted for the completion of Howard University the proper time.

METHOD OF CONDUCTING WORK.

The material was purchased by contract after due ad the case of brick, hydraulic cement, sand, iron lining a same. Other material was purchased under public noti cases when emergency required purchase in open market.

The brick was furnished by the Frederick Brick Works, Md., at $11.40 per thousand. The brick is most excelle and the rejections have been insignificant.

The hydraulic cement was furnished by James H. McG ington, at 82 cents per barrel, and has exceeded the requ to tests.

The castings for lining Rock Creek tunnel were furn Hoefinghoff & Laue Foundry Company, Cincinnati, Ohio, ton of 2,240 pounds. They are excellent in quality, are mos fitted for place, and are perfectly interchangeable.

The bolts, of satisfactory quality and workmanship, we by Bartlett, Hayward & Co., of Baltimore, Md., at 4.15 ce

ORGANIZATION.

The working force is organized into watches, and the gangs, according to their special work. Watches are cha hours—at 8 a. m., 4 p. m., and 12 midnight.

The work of mucking, removing rock, blasting, backing and filling voids in old lining was carried on in three w being continued during the twenty-four hours.

The brickwork of new lining and the placing of the iro carried on only during the first watch, or from 8 a. m to 4

Work at the head houses at each shaft was continuous, t being necessary to run the pumps and elevating cages.

The amount of work accomplished, with the cost, is given form in the accompanying tables.

LIGHTING THE TUNNEL.

ad been the practice to do all work underground by the light of s' lamps and torches. This means of illumination is very poor echanical work. The fumes and smoke from blasting, added to noke from torches and lamps, render the atmosphere underground, ally when the barometric conditions were unfavorable to ventila- ery offensive and discomforting to the workmen. An investi- of the subject of lighting the tunnel by other means, more ally at the locality where the mechanics were at work—brick and masons and the workmen on the iron lining—resulted in the selec- f acetylene gas as the most available and economical in this l emergency. Accordingly an acetylene-gas plant for 300 burners ected at Champlain avenue shaft, and one for 60 lights at Foundry h. The engine houses at the shafts, the head houses, and localities tunnel, when required, are lighted by these plants.

pipes were carried down the Champlain avenue shaft and along nnel both in an easterly and westerly direction, with cocks for rs at proper intervals, every 30 feet, and this system sufficed for nation from Rock Creek shaft to Howard University, a distance er 2 miles. The plant erected at Foundry Branch was in like er utilized for the illumination from that point in both directions. connecting with the stopcocks by means of rubber hose a mov- ight, chandelier or "Christmas tree," of any required number of rs is used, thus concentrating the light in the immediate vicinity work, and also enabling the illumination to be carried into the es or "crow nests," so called, behind the defective old lining. method of illumination has proved very satisfactory and quite mical. It is especially valuable as enabling good work to be done acilitating a thorough inspection of the same.

re are forwarded with this report blue prints from photographs ng the work on the tunnel in various stages; also drawings show- on lining, cross section of tunnel completed in new work, and cross n of some of the largest voids in old backing.

Money statement.

INCREASING THE WATER SUPPLY OF WASHINGTON, D. C.

, 1898, balance unexpended		$30.07
t appropriated by act approved June 30, 1898		594,421.00
t appropriated by act approved March 3, 1899		200,000.00
		794,451.07
0, 1899, amount expended during fiscal year		136,290.60
, 1899, balance unexpended		658,160.47
, 1899, outstanding liabilities	$20,920.81	
, 1899, amount covered by uncompleted contracts	74,874.77	
		95,795.58
, 1899, balance available		562,364.89
nt (estimated) required for completion of existing project, includ- Howard University Reservoir		301,399.23
nt (estimated) to be expended in fiscal year ending June 30, 1900		400,000.00
nt that can be profitably expended in fiscal year ending June 30, 1		139,034.34

Abstract of proposals for furnishing and delivering 5,000,000 brick, cement, and 5,000 cubic yards of sand for the work of increasing Washington, D. C., received in response to advertisement dated Dece opened January 26, 1899, by Lieut. Col. A. M. Miller, Corps of Eng

Name and residence.	Brick, per 1,000.	Cement, per barrel.
National Mortar Co., Washington, D. C	....	$0.99
Columbia National Sand Dredging Co., Washington, D. C. *a*	....	....
J. G. Waters & Son, Washington, D. C	....	.88
Frederick Brick Works, Frederick, Md. *a*	$11.40	....
Potomac Hydraulic Cement Co., Washington, D. C	....	.91
James H. McGill, Washington, D. C. *a*	....	.82
Grove Lime and Coal Co., Washington, D. C	....	.90
Standard Brick Co., Washington, D. C	11.73	....
	12.69	....
	b 10.23	....
	11.69	....
W. H. West & Bro., Washington, D. C	16.00	....
J. T. Walker & Sons, Washington, D. C	....	1.15
Lawrenceville Cement Co., New York, N. Y	....	.91

a Contract awarded.

b Arch

Amount available, $100,000, covering all materials.

Abstract of proposals for supplying about 340 tons of special castings a the work of increasing the water supply of Washington, D. C., rece advertisement dated December 27, 1898, and opened January 26, 18 A. M. Miller, Corps of Engineers.

Name and residence.	Special castings per ton (2,240 pounds).	
Thompson C. Gill & Co., Philadelphia, Pa	....	
Bartlett, Hayward & Co., Baltimore, Md. *a*	$48.00	
Standard Supply and Equipment Co., Philadelphia, Pa	77.72	
Stuart R. Carr & Co., Baltimore, Md	54.85	...
Barber & Ross, Washington, D. C	52.19	...
Petersburg Iron Works Co., Petersburg, Va	49.98	...
The Hoefinghoff & Laue Foundry Co., Cincinnati, Ohio *b*	36.40	
A. R. McHenry, jr., New York, N. Y	61.60	
W. T. & F. B. Weaver, Washington, D. C	....	
The Exeter Machine Works, Pittston, Pa	65.00	
J. B. Kendall, Washington, D. C	39.42	
Samuel J. Cresswell Iron Works, Philadelphia, Pa	47.35	

a Contract awarded for bolts.

b Contract awarded

Amount available, $100,000, covering all materials.

Abstract of contracts in force June 30, 1899.

Name.	Date appro
Columbia National Sand Dredging Co., for sand	Mar. 2
Frederick Brick Works, for brick	Mar.
James H. McGill, for cement	Feb. 2
Bartlett, Hayward & Co., for bolts	Mar.
The Hoefinghoff & Laue Foundry Co., for castings	Mar. 2

1

2

5

9

10

12

15

Eng 56 1

Table giving amount of work performed on the Washington Aqueduct Tunnel for the fiscal year ending June 30, 1899.

	1898.				1899.						
	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
Tunnel trimmed .... feet..	75	397	1, 554	2, 316	1, 550		25				5, 917
Track laid in tunnel .... do...		800	8, 105	10, 694	1, 000						20, 599
Material removed:											
Stone .... cubic yards..		422	2, 014	3, 092	3, 746	1, 548					10, 822
Muck .... do...		428	1, 650	2, 711	2, 216	1, 442	20		27	234	8, 728
Excavating drainage channel between Foundry Branch and Rock Creek:											
Distance excavated ..... feet..							950	552	625	685	2, 812
Stone removed .. cubic yards..							672	1, 534	2, 076	2, 298	6, 580
Muck removed .... do...							371	888	1, 101	1, 012	3, 372
Concrete in place .... do...							55	197	265	426	943
New brick lining:											
Invert .... feet..								417	655	393	1, 465
Side walls .... do...							123	417	655	240	1, 435
Arch .... do...							32	224	438	90	784
Invert placed in old lining .. do...									265	177	442
Old lining repaired .... do...								77	193	176	446
Timber removed from back of old lining .... cords..								16	35	13½	64½
Rubble masonry in place:											
Backing of old arch, cubic yards								192	690	691	1, 573
Backing of new arch, cubic yards							52	293	487	245	1, 077
Backing of iron lining, cubic yards									22	137	159
Iron lining under Rock Creek, feet									16	84	100

Expense on Washington Aqueduct Tunnel for fiscal year ending June 30, 1899.

Item.	Labor.	Material.	Total.
Erecting and maintaining machinery	$603.00	$7, 006. 71	$7, 609. 71
Erecting and maintaining buildings	1, 334. 00	1, 596. 61	2, 930. 61
Repairing road to Rock Creek	427. 00	396. 50	823. 50
Excavating and retimbering shafts and building head houses ...	3, 865. 00	3, 308. 76	7, 173. 76
Building and repairing cars	340. 00	1, 703. 28	2, 043. 28
Experimental arch at Rock Creek	117. 00	233. 50	350 50
Erecting and maintaining gas plants, and lighting tunnel	644. 00	6, 602. 78	7, 246. 78
First pumping out of tunnel	1, 388. 00	545. 90	1, 933. 90
Pumping out tunnel during construction	6, 470. 00	1, 903. 58	8, 373. 58
Trimming tunnel for lining	13, 508. 00	1, 076. 89	14, 584. 89
Excavating and track laying	21, 570. 00	5, 077. 51	26, 647. 51
Cutting drainage channel between Rock Creek and Foundry Branch:			
Trimming	13, 094. 00	627. 70	13, 721. 70
Excavating	12, 674. 00	290. 11	12, 964. 11
Cleaning out toothing in old brick work	326. 00	290. 11	616. 11
Cleaning snow and ice from roads	138. 00	38. 50	176. 50
Hauling coal during blizzard	63. 00		63. 00
Taking out old rail left by contractor	24. 00	162. 61	186. 61
Making centers for brick work	143. 00	669. 26	812. 26
Building brick arch and rubble backing	12, 097. 00	9, 657. 88	21, 754. 88
Concrete under invert	2, 823. 00	1, 984. 29	4, 807. 29
Repairing old arch with rubble masonry	4, 832. 00	2, 820. 80	7, 652. 80
Placing iron lining under Rock Creek	1, 522. 00	4, 312. 18	5, 834. 18
Iron on hand not laid		1, 008. 00	1, 008. 00
Engineering, superintendence, and office expenses	7, 922. 43		7, 922. 43
Total	105, 924. 43	51, 313. 46	157, 237. 89

B B B 3.

INVESTIGATING THE WATER SUPPLY OF WASHINGTON, DISTRICT OF COLUMBIA.

This work is being conducted under an act approved June 30, 1898, which contains the following clause:

> To enable the proper officer of the Government having charge of the Washington Aqueduct and the water supply of the city of Washington to make an investigation of the feasibility and propriety of filtering the water supply of Washington and to submit to Congress a full and detailed report thereon, and to meet all necessary expenses of said investigation, three thousand dollars. Said report shall be accompanied by a detailed estimate of the cost of the work required, and in making the investigation and in the preparation of this report the Chief of Engineers, United States Army, shall be associated with the proper officer of the Government in the charge of the Aqueduct as consulting engineer.

In addition to the above appropriation of $3,000 an additional appropriation of $5,000 was given by an act making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June 30, 1900, and for other purposes:

> For additional amount to enable the proper officer of the Government having charge of the Washington Aqueduct and the water supply of the city of Washington to make an investigation of the feasibility and propriety of filtering the water supply of Washington, and to submit to Congress a full and detailed report thereon, and to meet all necessary expenses of said investigation, five thousand dollars, to be immediately available.

The work for the fiscal year has consisted in the collection of data and information in relation to filtration of water supplies in this and foreign countries.

The methods of filtration adopted and in operation generally are:

First, slow sand filtration, the method adopted generally in England and the continent of Europe, more especially in Germany.

This method having been first adopted and developed by the English is frequently designated as the English system.

Second, rapid sand filtration. This method has been developed in this country and has been designated as mechanical, or the American system.

The slow sand or English method consists of passing the raw water through a layer of fine sand, supported by coarser material, and is conducted generally at a rate of from 2 to 2½ million gallons per acre per diem.

The mechanical or American system consists in passing the water rapidly through a coarser sand than in the English system and the use of some chemical, generally sulphate of alumina, as a coagulant. The rate of filtration by this method is about 128,000,000 gallons per diem per acre, or about fifty times the rate of the English method.

In order to ascertain the results of these methods of filtration with Potomac water, two filters have been erected, one on the English system and the other embodying the recent improvements on the American system. These experiments are being conducted with a view to showing the reduction in turbidities, the bacteriological results, and the safe rate of filtration to be adopted in the special case of the Potomac water.

The report required by Congress will be submitted as soon as sufficient data have been obtained to deduce a fair conclusion.

Money statement.

INVESTIGATING WATER SUPPLY OF WASHINGTON, D. C.

Amount appropriated by act approved June 30, 1898	$3,000.00
Amount appropriated by act approved March 3, 1899	5,000.00
	8,000.00
June 30, 1899, amount expended during fiscal year	1,916.63
July 1, 1899, balance unexpended	6,083.37
July 1, 1899, outstanding liabilities	78.60
July 1, 1899, balance available	6,004.77

APPENDIX C C C.

IMPROVEMENT AND CARE OF PUBLIC BUILDINGS AND GROUNDS IN THE DISTRICT OF COLUMBIA—WASHINGTON MONUMENT.

REPORT OF COL. THEO. A. BINGHAM, UNITED STATES ARMY, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

OFFICE OF PUBLIC BUILDINGS AND GROUNDS,
Washington, D. C., July 19, 1899.

GENERAL: I have the honor to submit the following report of operations upon public buildings and grounds in the District of Columbia, under the Chief of Engineers, during the fiscal year ending June 30, 1899:

In addition to the public buildings and grounds, this office has also been charged with the care and repair of the Government telegraph lines connecting the Capitol with the various Departments and the Government Printing Office; of the repair and improvement of the Government Printing Office; of the repair of the building on Tenth street NW. where Abraham Lincoln died; of the construction of the statue of Gen. John A. Logan; of such matters connected with the erection of the statue of General Sherman as may properly devolve upon the War Department; of the monument at Wakefield, Va., the birthplace of Washington, and the iron-pile dock erected under the supervision of this office in 1894, under the direction of the Department of State, at the mouth of Bridge Creek, Virginia; of the erection in the national military park at Gettysburg, Pa., of the memorial tablet to Abraham Lincoln; of the preservation, care, and safety of buildings occupied by the War Department in the District of Columbia, except State, War, and Navy Department building, and since March, 1899, of the banks of the Potomac River from the north line of the Arsenal grounds to the southern curb line of N street. From July 1 to July 11, 1898, I was also in charge of the Washington Aqueduct and increasing the water supply of the city of Washington.

PUBLIC BUILDINGS.

EXECUTIVE MANSION, GREENHOUSES, CONSERVATORY, AND STABLES.

Care and refurnishing.—The usual care was given to the Mansion and its furniture. Repairs were made to furniture and some new furnishings purchased. The window awnings were repaired, the frames of the five large awnings on south portico re-covered with new material and new awnings, shades, and wire screens placed at some of the windows. In October, 1898, all carpets were relaid, lace curtains, window draperies, and door portieres hung, and the house placed in order for the winter. Before the carpets were relaid about 1,200 yards of new straw matting were purchased and laid in different apartments to replace that which had become worn and unserviceable. Four hundred yards of new carpet lining were purchased and laid, and some of the old straw matting was taken up, cleaned and relaid. The awnings were removed from the windows in the autumn and replaced in the spring. In May, 1899, the carpets were taken up, cleaned, and stored, the lace curtains and draperies removed from the windows, the laces laundered, the draperies cleaned, and all packed away for the summer. New draperies were placed at window of private corridor, second floor, and at window of one of the bedrooms. Ten new portable fire extinguishers were purchased and placed on first and second floors.

A new police electric call service was installed in the Mansion; it consists of five push buttons, located at different points on the ground floor and connected by underground cable with a telephone in the watchbox at the southeast corner of the house, from which connection is made with police headquarters through the cable running underground from the Mansion to the Treasury Department.

Painting.—The entire exterior of the Mansion was repainted in October and November with two coats of white, the materials being purchased under contract and the work done by hired labor. The stone copings and posts in front were also painted, and the lamps and shields on north portico bronzed. The following have also been painted: The tin roof and the chimneys; twenty-two new sections of wooden platform on roof; sixteen storm-window sash; the woodwork of one bathroom; portions of the woodwork in main corridor; the bottoms of the four columns on north portico. The walls and ceiling of a small bedroom were repapered and the woodwork repainted. The skylight over elevator shaft was partially reglazed and repainted, and some of the woodwork in the Mansion touched up.

Repairs.—The plastered ceiling of the south portico was repaired, the chimneys cleaned, the water-supply tanks in the attic and on the roof cleaned out, and a new soapstone sink with grease trap placed in the small kitchen. Repairs were made to the tin covering of roof and to the copper leaders from the gutters; eighteen 8-foot sections of additional slat walk made and placed on the roof to prevent injury by persons walking over it, and the old flag pole taken down and replaced with a new iron flagstaff. Drawers, doors, and sashes throughout the Mansion were eased and repaired, new sash chains put in and locks repaired. The hot-water heating pipes in the basement were examined and put in good order, new shelving and cupboards constructed in the steward's room and storeroom adjoining and the woodwork painted. The large corridor and nearly all of the rooms in the basement and the walls of the area around the Mansion were whitewashed. The machinery, rails, and other appliances connected with the electric elevator examined, cleaned, and thoroughly oiled. Minor plumbing, gas fitting and carpentry repairs were made as required.

Electric work and lighting.—A new force pump with electric motor was set in place in the engine room in basement for supplying water to the tanks at top of the house and all wire and pipe connections made. This replaces a steam pump. Changes were made in the electric wires in the basement, those carrying the current for power being separated from those for lighting. One hundred feet of four-way terra-cotta conduit was laid in cement concrete at the base of the north wall of one of the greenhouses west of the conservatory in which it is proposed to place the main cables now running along the top of that wall, which carry the current from the dynamos in the State, War, and Navy Department building to the Mansion. All electrical appliances were maintained in good condition and necessary repairs and minor alterations made as required. The lamp-posts on the south portico which contained incandescent lamps were removed, being no longer needed. An arc electric lamp was hung from the ceiling of the north portico and the use of gas for lighting the portico dispensed with. New wires were placed in the elevator shaft to light the car, and new wires for lighting were placed in the red bedroom and the library, placing them in tubes beneath the plaster. The chandeliers and electric-light fixtures were cleaned and all the electric lamps on the second floor were replaced with new ones, and gas globes replaced with new where required. The large northeast room was rewired for the introduction of eight additional drop desk lights and one desk lamp. New wires were run for an electric-bell connection between two of the office rooms and new wires were run in the attic to supply current to operate a new switchboard for the automatic telephone system in the Mansion.

Receptions.—The woodwork on twenty-three of the cloak boxes used at receptions was stained, and the boxes renumbered where necessary, and five new cloak boxes, each with fourteen receptacles, were made, increasing the capacity from 1,068 to 1,138 persons. The cloak boxes were put up, canopies erected and floor crash laid for a reception given in October to the visiting delegates to the Episcopal convention held in this city during that month, and the canopies, exit bridge, and storm doors erected for the reception on New Year's Day. The exit bridge, storm doors, canopies and frames and cloak boxes were placed in position for six official receptions in January and February, and the east room, parlors, corridors, etc., beautifully decorated with plants and flowers for those functions and for the state dinners given in those months. Similar preparations, omitting the cloak boxes and some of the floral decorations, were also made for a public reception given in May during the National Peace Jubilee.

East room.—Nine pairs of new drapery curtains were made and placed at the windows and the furniture in the room repaired, reupholstered, and re-covered with new materials. This furniture consists of 2 sofas, 8 armchairs, 12 side chairs, and 4 corner chairs; 26 pieces in all. The large globes on the ceiling which cover the electric lights were taken down, cleaned, and replaced and new electric lamps placed upon the chandeliers.

State dining room.—The crystal chandeliers were overhauled and one of them taken down to permit of repairs being made to the electric wiring. Forty dining chairs were repaired, refinished, and re-covered with new leather.

Blue bedroom.—The walls and ceiling were scraped and repapered, the woodwork, cornice, and centerpiece on ceiling painted, frame of mirror regilded, new matting laid, base shoe and molding completed, and new carpet strips made and put down.

Red bedroom.—The two window cornices and the bed canopy frame were regilded.

Northwest corner room.—The bath tub was taken out and replaced by a new tub of modern design and the windows in the room painted.

Large north bathroom.—The bath tub in this room was taken out and replaced by the tub removed from the northwest corner room.

Drainage conduit.—It is a great pleasure to report the completion of an entirely new system of underground mains of all kinds, sewer, water, gas, and electric; thus doing away with all old underground drains, sewers, pipes, etc., which had unavoidably become complicated, confusing, and partly unknown by lapse of time; and I am now able to report this vitally important part of the Mansion as in perfect order under ground. What is above ground has still to be overhauled. The improvement consisted in making an entirely new sewer connection at a distance of about 500 feet from the Mansion, constructing from this point a concrete tunnel under the house, placing in this tunnel all mains of whatever kind, and cutting off all former underground connections. This tunnel is provided with frequent manholes of large size, so that in future no excavation will be necessary, and every inch of all mains can be quickly got at for examination or repairs. Rain-water flow is kept separate from sewage, and the soil pipe is of the so-called Durham system.

This work was greatly delayed and its necessary cost considerably increased by lack of accurate guiding maps, lack of office force to get out the necessary drawings and estimates, then by the great difficulty experienced in getting material at reasonable prices, later by almost continual rains, and finally by the necessity of doing the work while the President and his family were in the Mansion.

The general items of cost were as follows:

Engineering and drawings			$725.00
Concrete	Lumber	$31.83	
	Cement	862.32	
	Sand	96.50	
	Gravel	167.32	
	Stone	405.77	
	Labor	2,255.10	
			3,818.84
Cast-iron pipe and fittings		1,360.93	
Wrought-iron pipe and fittings		596 22	
Labor on pipe		515.09	
			2,445.24
Cutting and shoring walls, removing and replacing joiner work			112.03
Outside connections			450.52
Conduit for electric cables			79.38
Forty-seven manhole covers and frames			545.23
Cesspools			48.65
Replacing mastic pavement			423.80
Cleaning up and hauling away			27.25
Total			8,675.94

This work gave opportunity for a new and accurate map of all underground mains, showing disused and disconnected mains so far as actually discovered, and the supposed location of other mains as shown by old plans or as deduced from the disclosures of excavation.

The publication of this map will prevent the loss of this information.

Greenhouses, Executive Mansion.—Necessary repairs were made to the woodwork in the houses, all repaired work painted, broken glass replaced with new glass, boilers, flues, chimneys, and pipes of heating apparatus cleaned out and repaired where necessary. Some new cold frames were made to replace old ones, new lath shutters for shading frames and houses made and old shutters repaired. The woodwork in interior of the orchid house was painted and the glass frosted. Wooden boxes were set in the walls of rose house to serve as bottom ventilators, the brick floor of its furnace room taken up, the ground raised to proper level and the floor relaid. Some necessary whitewashing was done. The usual care was extended to the large collection of plants, greenhouse flowering plants and bedding plants for the ornamentation of the grounds were propagated, and 17,043 bulbs purchased under contract for forcing in the houses and planting in the grounds. In August

nearly 60,000 tulip, hyacinth, and crocus bulbs were cleaned and stored for future use.

A new greenhouse for ferns was constructed during the year. It is what is known as a lean-to, is 53 feet 4 inches long, 13 feet 8 inches wide, 18 feet 10½ inches high at north side, and 8 feet 6 inches high at the south side. It is built against the north wall of the grapery, which forms the south wall of the new house. It is heated with pipes connected with the boiler of the grapery. The old woodwork and sashes from the west wing of the conservatory were used in constructing this house as far as possible.

Conservatory, Executive Mansion.—The work of replacing the old superstructure of the west wing with a new superstructure with iron framework, commenced in May, 1898, was completed in August. Repairs were made to the woodwork of the superstructure of the main building and all broken glass replaced with new. The urinals under conservatory were partially reconstructed and part of the iron railing west of the building painted. Some necessary whitewashing was done and the electric lamps examined and placed in good condition.

Attention is again invited to the conservatory, the frame of which is of wood, rapidly decaying and almost in a dangerous condition. A new iron superstructure, at an estimated cost of $15,000, is necessary.

Stable, Executive Mansion.—Repairs were made to the tin and slate roofs and 80 feet of new tin down spout placed in position; three new cupboards were built; new racks placed; necessary painting done; old flooring removed and replaced with new; stalls and blinds repaired, and other minor carpentry repairs made and chimneys cleaned. Necessary attention was paid to the drain pipes and gas pipes, and a new water service was introduced in consequence of the old pipe having become choked; 122 feet of new 2-inch water pipe were laid and a 2-inch fish trap placed on the same.

Stable, public buildings and grounds.—Minor repairs were made to this building, which stands in the rear of the Executive Mansion stable.

The roof was repaired and painted, the interior of the wagon room sealed with tongued and grooved Virginia pine flooring, and the floor of the room and of the harness room painted. A harness cupboard was remodeled and a small cupboard put up, new harness racks placed, doors trimmed, and other carpentry repairs made, window sashes reputtied, and broken glass replaced.

PAVING ROADWAY ON EAST AND SOUTH SIDES OF STATE, WAR, AND NAVY BUILDING.

Congress at its last session having appropriated the amount necessary for this, and the Comptroller having decided that the work could be done before the beginning of the fiscal year provided it be not paid for until after July 1, bids were invited and a formal contract entered into May 19, 1899, with the Cranford Paving Company, the lowest bidder.

The work began May 29, 1899, and was completed by June 30, 1899.

PRESIDENT'S REVIEWING STAND, NATIONAL PEACE JUBILEE.

On May 5 the chairman of the decoration committee of the National Peace Jubilee addressed a letter to the Secretary of War requesting a permit for the erection of a "President's reviewing stand" on the reservation immediately in front of the Executive Mansion, in connection with the National Peace Jubilee, to be held May 23, 24, and 25.

This letter was referred to this office by indorsement, as follows:

WAR DEPARTMENT,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D. C., May 5, 1899.

Respectfully referred to the officer in charge of public buildings and grounds for immediate recommendation and report hereon.

G. D. MEIKLEJOHN,
Acting Secretary of War.

and was returned to the War Department May 6, with the following report:

[Second indorsement.]

OFFICE OF PUBLIC BUILDINGS AND GROUNDS,
May 6, 1899.

Respectfully returned to the Assistant Secretary of War.

In Volume 26, U. S. Stats., p. 396, the act approved August 30, 1890, distinctly states, "And hereafter no temporary structure of any kind shall be erected upon any reservation except when authorized by special act of Congress."

The sidewalk in front of the Executive Mansion is a part of the public reservation under the jurisdiction of this office. Congress always passes a special act which covers the erection of the reviewing stand in front of the White House for inauguration ceremonies. Therefore, while this office is ready to grant any request which may be within its legal powers, it is believed that the above provision of law prohibits this office from issuing the permit herein asked for.

THEO. A. BINGHAM,
Colonel, United States Army, Major, Corps of Engineers.

The letter was received back at this office May 8, indorsed as follows:

WAR DEPARTMENT,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D.C., May 6, 1889.

Respectfully referred to the Judge-Advocate-General, requesting an immediate opinion as to whether the Secretary of War can lawfully grant the authority herein requested.

G. D. MEIKLEJOHN,
Acting Secretary of War.

[Fourth indorsement.]

WAR DEPARTMENT,
JUDGE-ADVOCATE-GENERAL'S OFFICE,
Washington, D. C., May 6, 1899.

Respectfully returned to the Secretary of War.

Although the sidewalk in front of the Executive Mansion is, as the superintendent of public buildings and grounds states, a part of the public reservations, I think it may be held that in the legislation referred to (26 Stat., 396) the word "reservation" is limited by the object of the legislation, which is understood to have been the protection of the parks and not to have had relation to the sidewalks, and therefore that in this connection reservations do not include sidewalks.

G. N. LIEBER,
Judge-Advocate-General.

WAR DEPARTMENT,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D. C., May 8, 1899.

Respectfully referred to the officer in charge of public buildings and grounds, to issue the necessary permit in this case, subject to such conditions and restrictions as he may deem proper in the public interests.

G. D. MEIKLEJOHN,
Assistant Secretary of War.

In obedience to the instructions contained in the last indorsement, a permit was issued by this office May 8 to the chairman of the decoration committee of the peace jubilee for the erection of the reviewing stand on the public sidewalk in front of the Executive Mansion grounds, the plans for the stand to be approved by, and its construction to be under the supervision of, this office.

Under this permit the committee caused the reviewing stand to be erected for the purpose indicated, and it was removed after the jubilee ended.

WASHINGTON NATIONAL MONUMENT.

The usual care has been extended to maintain the Monument and its machinery in good condition and to keep the interior of the shaft clean. Several acts of vandalism occurred during the year, consisting of the defacing of memorial blocks, etc., by chipping pieces from them. In only one of these cases was the offender detected and arrested.

With one exception, in April, when repairs were in progress, the elevator and all machinery connected therewith have been carefully inspected each month by an agent of the builders and pronounced in good and safe condition. Weekly inspections are also made by the steam engineers at the Monument, and tests of the safety appliances on the elevator car are made daily by the employees before starting to carry passengers to the top.

The operation of the machinery was suspended once each quarter, the boilers washed out, examined, and tested with cold-water pressure, and necessary repairs made to furnaces, steam pipes, and connections. To permit of these examinations and repairs the machinery was shut down from September 26 to October 1, 1898; January 3 to 4, March 27 to 29, and June 26 to 30, 1899, inclusive. It was also stopped from April 24 to 30 and May 1 to 6 to permit repairs to be made to the 6-inch main steam pipe in tunnel and the placing of new expansion joints thereon. The main steam pipe in shaft of tunnel near engine room was changed from 5-inch to 6-inch.

A new feed-water heater with brass tubes was purchased, placed in position in boiler house, and connected with the boilers, replacing an old heater which had become unserviceable. Some new cork covering was placed over the new heater. New grate bars were placed in furnaces and their walls repaired, joints on steam pipes made tight, and valve stems on boilers and engines and piston rods on engines repacked. A new flush tank with necessary valves has been placed in the water-closet in boiler house. During a heavy rain storm in October considerable trouble was caused by water coming through the walls of the coal vault of boiler house. To correct this the ground outside the house about the vault has been raised and graded so that the water will run off. During a heavy rain in August the water backed up from the public sewer on B street, so that there were 12 inches of water on the floor of the boiler room and 3 inches on the floor of the boiler pit in the lodge house.

Necessary minor repairs were made to the elevator engines, the steam and exhaust pipes on the dynamo engine, and a small portion of those on elavator engines covered with cork covering. All of the iron frame work from the lower floor to the 20-foot landing, the door and door frames at entrance, the partition and door of storeroom and the windows, door frames and doors in engine room have been repainted. A wire screen was placed in position at the 490-foot landing to prevent visitors from falling over the hand rail of the stairway leading from that landing to the top floor.

A new lead-covered wire, 700 feet in length, was run through the steam pipe tunnel to replace an old and unserviceable wire which connected the telephones in the engine room and boiler house.

Leaks in the roof of the lodge house were repaired, the ceiling of the waiting room calcimined, an automatic flush tank for flushing the closet placed in the toilet room, a new smokepipe placed upon the heating boiler, the boiler cleaned and its pipes and base painted.

During the extreme cold weather which prevailed for several days in February, 1899, some of the pipes and the steam pump connected with the steam plant were broken by frost, in consequence of which the elevator and electric light machinery were not in operation from the 13th until the 20th. The necessary repairs were made as soon as possible and by February 27 all the machinery was again in operation.

The four iron rods at the base of the Monument which were used during construction in finding the levels of the foundation were located and a piece of 4-inch iron pipe with cap placed over each as a guard for future use in taking levels.

On the evenings of May 12 and 14, 1899, the elevator and electric lights were in operation from 7.30 to 10.30 o'clock for the accommodation of the American Society of Mechanical Engineers, which held its annual meeting in Washington during that week.

In the quarterly "shut down" for careful inspection of boilers and machinery and repairs, it was found that considerable repairs were needed in the steam pipe. Advantage was taken of this opportunity to get rid of one of the awkward expansion arrangements. This was in the form of a letter W and 20 feet high. It has been replaced by an expansion joint working like a cylinder and piston.

Certain other peculiarities of construction in the steam piping have been corrected as funds and opportunities permitted.

Permanent telephone connection of the top of the Monument with the engine room, boiler house, and elevator cage has been made. Formerly when the elevator was at the bottom the top of the Monument had no connection with anything below except by the stairway.

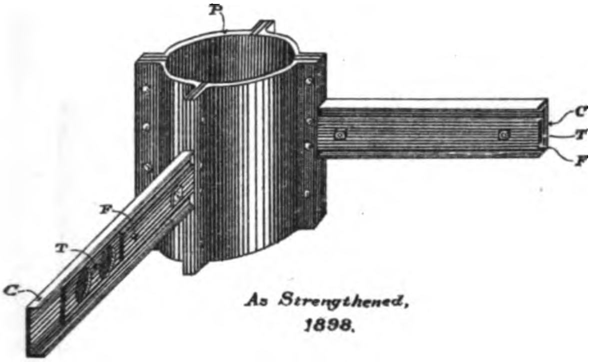
Changes in iron framework.—The addition of channel beams to the tie rods begun last year has been carried from the base to the 350-foot level.

The elevator now runs without binding at any point, and the framework has been made rigid so far. These beams were inserted by using a turnbuckle spreader between the Phœnix columns and then placing them over and bolting them to the perforated tie rods. As these channels are all of the same length, a certain amount of twist has been taken out of the iron framework and the whole made more rigid up to the 350-foot level. The work thus done has produced changes in the framework above 350 feet, and this work has been temporarily suspended to permit of other measurements and further study of the matter.

The following table shows the number of visitors to the top of the Monument each month, both by the elevator and stairway, the total number during the year, and the aggregate number since the shaft was opened to the public, October 9, 1888:

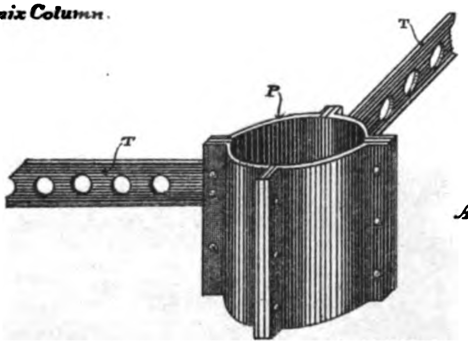
	Number by the elevator.	Number by the stairway.	Total.	Aggregate since October 9, 1888.
1898.				
July	12,275	11,589	23,864	1,572,560
August	10,329	4,174	14,503	1,587,063
September	6,991	4,166	11,157	1,598,220
October	8,888	4,133	13,021	1,611,241
November	6,464	2,682	9,146	1,620,387
December	7,086	2,442	9,528	1,629,915
1899.				
January	6,074	1,840	7,914	1,637,829
February	3,528	2,227	5,755	1,643,584
March	7,728	3,410	11,138	1,654,722
April	7,987	6,922	14,909	1,669,631
May	9,115	9,835	18,950	1,688,581
June	5,152	2,985	8,137	1,696,718
Total	91,617	56,405	148,022	....

CORPS OF ENGINEERS. U.S. ARMY.
Office of Public Buildings and Grounds.
WASHINGTON, D.C.



As Strengthened,
1898.

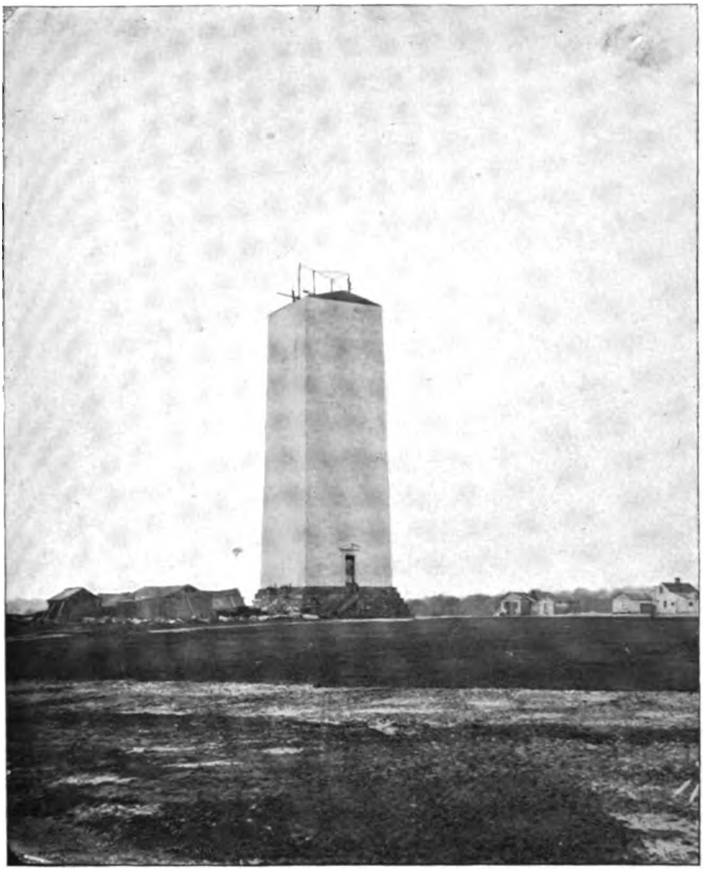
C	5" × 7¼" Channel
T	4" × ½" Tie Bars, 1¾" Holes 3" sp.
F	2½" × ¼" Flat, Bolts 2' sp.
P	9" Phœnix Column.



As built.

Perspective View of Phoenix Columns,
Washington Monument.
Showing original bracing
by tie rods which buckeled
and method adopted to
correct and strengthen them.

To accompany annual report of Theo. A. Bingham
Col. U.S.A.
June 30th 1898.



WASHINGTON MONUMENT. AS IT LOOKED BEFORE 1878.

The small number of visitors during the month of February compared to the number in January was probably owing to the heavy snowstorm which commenced on February 11 and lasted three days, ending in a blizzard on the 13th. For two days, February 13 and 14, the Monument was not open, it being impossible to reach it on account of the great depth of snow, a condition that has never before existed since it was opened to the public in October, 1888.

ELECTRIC ELEVATOR FOR THE MONUMENT.

While the present steam machinery is in good order and works satisfactorily, it is only because of unremitting attention and extreme care. In these days it is a clumsy system. Steam is carried 800 feet under ground with many pipe joints requiring continual care of their packing; one of the two boilers practically does nothing but keep this pipe hot. The elevator cage is 1,000 pounds heavier than need be; and so on.

It would be very easy to substitute electric power. A small addition to the boiler house could be built to hold the dynamos; the current would be carried under ground where the steam pipes now are. A lighter elevator cage could be used, with a counterweight, so as to make the load on the dynamos as light as possible. The lighting of the Monument would not then require a separate dynamo.

More than this, there would then be an independent source of power for lighting the grounds about the Monument and south of the Executive Mansion, and even for the use of the Executive Mansion itself and its front grounds.

Owing to the increased cost of material during the past year the estimate has had to be increased above the figures given in 1898, as follows:

Estimated cost of addition to boiler house	$6,500
Estimated cost of one dynamo and connections, including installation of new system	20,000

LEVELS AT WASHINGTON MONUMENT.

Bench mark, to which levels are referred, was established by the Coast and Geodetic Survey in April, 1899, and is 29.632 feet above mean sea level.

Elevations of bench marks at corners of Monument above mean sea level.

Date.	Northwest.	Northeast.	Southwest.	Southeast.	Remarks.
May 19, 1898	40.776	40.815	40.776	40.815	
May 4, 1899	40.755	40.756	40.760	40.760	Weather very dry and hot.
June 5, 1899	40.772	40.739	40.724	40.727	Levels taken in cool of evening.

FIREWORKS ON THE MONUMENT GROUNDS.

On April 3, 1899, the chairman of the fireworks committee of the National Peace Jubilee applied to the Secretary of War for permission to use the Washington Monument grounds for a display of fireworks on May 23, 24, and 25. The letter was referred to this office from the War Department and was returned to that Department with the following indorsement:

[Third indorsement.]

OFFICE OF PUBLIC BUILDINGS AND GROUNDS,
Washington, D. C., April 5, 1899.

Respectfully returned to the Secretary of War.

There is no objection by this office to the fireworks exhibition. Attention is, however, called to paragraph in the sundry civil act approved August 30, 1890, volume

26, Stat. L., page 396, which reads as follows: "And hereafter no temporary structure any kind shall be erected on any reservation, except when authorized by special act of Congress."

Provided that the terms of the law as quoted are strictly complied with, which it is believed prohibits the erection of stages, seats, etc., it is recommended that a permit be granted for the use of the grounds north of the Washington Monument, adjoining B street, for the fireworks proper.

THEO. A. BINGHAM,
Colonel, United States Army, Major, Corps of Engineers.

The application was then referred by the War Department to the Judge-Advocate-General of the Army, who reported as follows:

[Fifth indorsement.]

WAR DEPARTMENT,
JUDGE-ADVOCATE-GENERAL'S OFFICE,
Washington, D. C., April 8, 1899.

Respectfully returned to the Secretary of War.

This is an application "for the use of the Monument grounds during the National Peace Jubilee to take place on May 23, 24, and 25 next, for a fireworks display, to be given on the nights above named."

The officer in charge of public buildings and grounds says in the third indorsement hereon:

"There is no objection by this office to the fireworks exhibition. Attention is, however, called to paragraph in the sundry civil act approved August 30, 1890, volume 26, Stat. L., page 396, which reads as follows: 'And hereafter no temporary structure of any kind shall be erected upon any reservation, except when authorized by special act of Congress.'

"Provided that the terms of the law as quoted are strictly complied with, which it is believed prohibits the erection of stages, seats, etc., it is recommended that a permit be granted for the use of the grounds north of the Washington Monument, adjoining B street, for the fireworks proper."

I am of the opinion that the Secretary of War has power to permit the use of the grounds, and I do not think that the statute quoted would prevent his also authorizing the erection of such stages, seats, etc., as are necessary in order to adapt the grounds to the purpose intended. The prohibition of the legislation referred to should not, in my opinion, be construed as directed against these, but rather to be directed against such temporary structures as are liable to be erected for occupation or trade, or that are not required in order to adapt the grounds to a temporary legal use.

G. N. LIEBER,
Judge-Advocate-General.

The application was then returned to this office with following indorsement:

[Sixth indorsement.]

WAR DEPARTMENT,
ASSISTANT SECRETARY'S OFFICE,
Washington, D. C., April 13, 1899.

Respectfully returned to the officer in charge of public buildings and grounds for report as to whether the use of the Monument grounds, as proposed in letter herewith, dated 12th instant, from Pain's Fireworks Company, is contrary to the public interest.

In view of the opinion of the Judge-Advocate-General in the fifth indorsement hereon, recommendation is desired as to the propriety of granting the use of the grounds as suggested, and also as to the conditions under which such authority shall be granted.

G. D. MEIKLEJOHN,
Acting Secretary of War.

The application was returned to the War Department April 14, with report and recommendation as follows:

[Seventh indorsement.]

OFFICE OF PUBLIC BUILDINGS AND GROUNDS,
Washington, D. C., April 14, 1899.

Respectfully returned to the Secretary of War.

The use of that part of the Monument grounds proposed in the letter herewith by Pain's Fireworks Company, is not, in the opinion of this office, contrary to the public interest.

Since the legal branch of the War Department is of opinion that the Secretary of War has power to permit the use of the grounds in this case and to authorize such erections as are necessary for the purposes intended, it is recommended that if the permission asked for is granted by the honorable Secretary of War the following conditions should be inserted:

First. That nothing in the way of staging shall be erected excepting such framework as may be absolutely necessary to support the pyrotechnical display contemplated.

Second. That such seats as are contemplated shall be entirely movable in character, and no seat or combination of seats shall be heavier than can be moved by two men.

Third. That all other details shall be left to the decision of the officer in charge of public buildings and grounds.

THEO. A. BINGHAM,
Colonel, United States Army.

On April 20, 1899, the papers were received back at this office with the following additional indorsement:

WAR DEPARTMENT,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D. C., April 14, 1899.

Approved as recommended by the officer in charge of public buildings and grounds in seventh indorsement hereon, and subject to the further condition that the occupation of the grounds and the erection of any structures thereon shall be under the direct supervision and control of the officer in charge of public buildings and grounds.

The necessary instrument of authority will be accordingly prepared and forwarded to the proper parties.

G. D. MEIKLEJOHN,
Acting Secretary of War.

[Tenth indorsement.]

WAR DEPARTMENT,
JUDGE-ADVOCATE-GENERAL'S OFFICE,
Washington, D. C., April 15, 1899.

Respectfully returned to the Secretary of War with instrument prepared in duplicate.

G. N. LIEBER,
Judge-Advocate-General.

The instrument referred to in the tenth indorsement was a revocable license granting the fireworks committee, National Peace Jubilee, the use of the Washington Monument grounds for a fireworks display on May 23, 24, and 25, including the erection of framework necessary to support the pyrotechnical display and the placing of seats for spectators.

This license, in duplicate, was signed by the Secretary of War April 17, and one copy transmitted by letter of that date from the War Department to the chairman of the fireworks committee.

Under that permit the committee caused to be erected during May upon the grounds between the Monument and B street north poles and frames with canvas scenery, frames for set pyrotechnic pieces, an artificial lake of water held in canvas laid upon the ground about 200 feet long and 30 feet wide, and seats for, it is said, about 11,000 spectators, consisting of chairs for reserved seats and wooden benches for seats not reserved, the whole being surrounded by a fence of meshed wire stretched upon posts.

All the material of which the framework, scenery, stands, seats, etc., were composed were removed and the grounds cleaned up by the committee after the exhibition was over.

The damage done amounted to about $200, in addition to which is the several years' time required for the shrubs and trees injured to attain their former growth and luxuriance.

BUILDINGS OCCUPIED AS OFFICES BY THE WAR DEPARTMENT, EXCEPT STATE, WAR, AND NAVY DEPARTMENTS BUILDING.

Under date of June 30, 1893, these buildings were placed under the charge of this office so far as their preservation, care, and safety are concerned, and on July 1, 1898, they consisted of nine buildings. On August 9, 1898, I was officially informed that two additional buildings had been leased by the War Department, viz: No. 1712 G street NW. and the building at the southwest corner of Seventeenth and F streets NW., and on October 29, 1898, that the Lemon Building, No. 1729 New York avenue, had also been leased by the Department, making a total of twelve buildings, other than the State, War, and Navy, occupied by the Department, as follows:

Army Medical Museum and Library, Seventh and B streets SW.
Ford's Theater Building, 511 Tenth street NW.
Annex to Ford's Theater Building, 509 Tenth street NW.
No. 610 Seventeenth street NW., Record and Pension Office.
Southwest corner Seventeenth and F streets NW., office of depot quartermaster, United States Army.
No. 1725 F street NW., branch printing office, War Department.
No. 1712 G street NW., Rebellion Record Office.
No. 1744 G street NW., Ordnance and Pay Departments, United States Army.
No. 1814 G street NW., Medical Department, United States Army.
Annex to Winder Building, Ordnance Department, United States Army.
War Department stables, G street, between Seventeenth and Eighteenth streets NW.
Lemon Building, No. 1729 New York avenue NW., occupied by Supply Division, War Department, etc.

Monthly inspections have been made of these buildings during the year and they are believed to be in good and safe condition for the purposes for which they are being used. Suggestions have been made from time to time as to strengthening the floors of some of the buildings wherever thought necessary and for needed repairs, and these suggestions have been carried out by the supply division of the War Department, the repairs, etc., of the buildings being made under the direction of that division and paid for from appropriations under the control of the War Department.

HOUSE NO. 516 TENTH STREET NW., WHERE ABRAHAM LINCOLN DIED.

This building has been under the supervision of this office since November, 1896, when the property was purchased by the United States.

The house has been in charge of Mr. Oldroyd, who is occupying it free of rent and acting as temporary custodian without pay.

A balance of $827 is still available for repairs, and at its last session, on March 3, 1899, Congress appropriated, in addition, $3,833.50 to put the building in good condition. Project for this work has been submitted and approved, and work will be begun with the ensuing fiscal year.

IMPROVEMENT OF THE PUBLIC GROUNDS IN THE DISTRICT OF COLUMBIA.

VARIOUS RESERVATIONS.

The area covered by the parks and park spaces in the District of Columbia under charge of this office is about 405 acres, within which there are 13.4 miles of gravel and asphalt walks, covering an area of 16.9 acres, and 7.6 miles of gravel and asphalt roads, covering an area of 33.03 acres.

There are in all 301 reservations, varying in size from a few hundred square feet to 82 acres. These reservations are classified as follows:

	Number.	Acres.
Highly improved	94	351.12
Partially improved	42	5.64
Unimproved	165	48.32
Total	301	405.08

Of these 66 are inclosed with post-and-chain and other low iron fences.

The annual report of my predecessor for 1893 outlines a general plan for the development of park improvement.

Each year an effort is made to add to the list of improved reservations, but owing to lack of necessary funds the progress is very slow. It is not generally realized how much beauty the smaller spaces are capable of exhibiting should they be brought to their highest condition of improvement. It is in a measure true that the outlay in this development is considerable, but the subsequent maintenance of these spots of beauty in their highly improved condition is comparatively light, and not much more than the expense now incurred in mowing their grass surfaces.

The last Congress appropriated an extra $10,000 for the improvement of various reservations. Project for the application of this sum has been submitted and approved and work will be begun with the ensuing fiscal year. It is hoped partially to improve with this amount as many as twenty unimproved reservations, covering 8.5 acres.

Experience throughout our country in landscape gardening has proved that for maintenance with the best results it is necessary to have one experienced gardener and two laborers per acre. Consequently, when the limited force at the disposal of this office is considered, the results heretofore obtained are very creditable to the energy and economy of the employees of this office.

THE GENERAL TREATMENT OF THE PARKS IN WASHINGTON.

The Washington parks, present and prospective, fall into two distinct classes. In the first class are Rock Creek Park, Soldiers' Home, the future (possibly) Anacostia Flats, and the Potomac Flats.

These are all capable of extensive and beautiful development in the highest sense, and they are large enough for the display of all the resources of the landscape gardener's art. Long vistas of greensward and foliage are practicable, shaded drives are possible, and the variations of terrain lend themselves to the most artistic treatment possible.

Moreover, these large parks should be, and no doubt some day in the future will be, connected by magnificent boulevards, the whole thus constituting an emerald setting for the beautiful city within.

While the possible future Anacostia Flats are still only on paper and the connecting boulevards are only an idea, the Potomac Flats have arrived at a point in their existence where foresight may prove of great value. They are still to be filled up 3 feet higher. The earth with which this will be done is unsuitable for vegetation and will have to be underdrained before it can be used. If this subsoil drainage were studied out now and the tiles laid as filling progressed it would hasten the availability of the park and save expensive excavations to lay these drains at a future date.

The second class of parks above referred to present a different phase of the art and must be treated with more attention to their practical usefulness than to their artistic culture. They are the breathing spaces of a large city, and are used more by the poorer people in thei daily life than are the large parks. Here children and nurses congre gate, and here during the long hot summer those who can not leave th city go for a breath of fresh air or to find such breeze as may be stirrin and unable to penetrate the interior of the heated houses.

On this account and on account of their small size the art of th landscape gardener is limited by utilitarian requirements. It is poss ble, of course, to drape the foliage to advantage about the statues o fountains and to please the eye by flowering shrubs and beds of flower ing plants. But experience has shown that no concealment must b possible for wrongdoers, and the plants must be such as not to interfe with the breeze and make the benches and seats as hot as the house This necessitates great openness in the planting of these small par and is the reason why some of them which were thickly overgrow have been thinned out.

The requirements of city life in this subtropical climate call loudly fo

FOUNTAINS

and that they should be increased in number instead of being dimi ished, as is now the case. The necessary water should not be grudge for its use can be held under strict control.

There ought to be one or two very large and beautiful fountains here including a superb electric fountain. This latter need cause no fear o wastefulness of water, for the water will be pumped over and ove again by the same power that illuminates the water.

THE PARKS OF WASHINGTON IN RELATION TO PARKS OF OTHER CITIES.

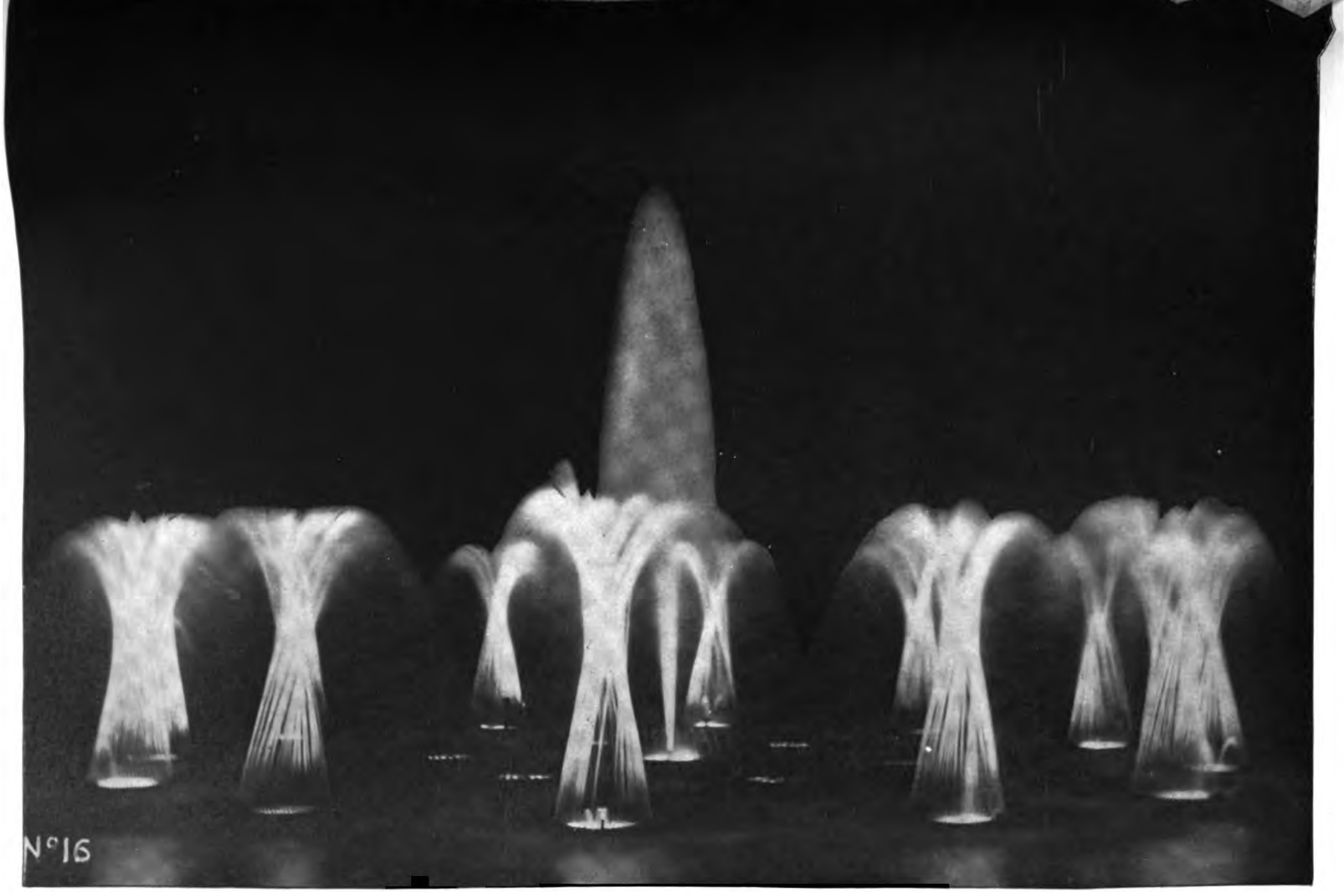
As superintendent of parks of the city of Washington, this office i in receipt of many inquiries from all parts of the country; visits hav also been received from park superintendents of other cities. Thi correspondence only shows the force of the remark often made in pas years in annual reports of this office, that "the park authorities o other cities throughout the country think it most natural to look to the park system of the Capitol city for a model in what pertains to the development, improvement, and maintenance of parks," and emphasizes the disappointment with which they realize on how slight a basis their expectations are founded.

The officer in charge of public buildings and grounds has often been urged to become a member of the Association of American Park Superintendents; to attend and make addresses at their conventions, and in other ways to give the parks throughout the country the benefit of the experience of this office, and to derive for this office such benefits as would naturally accrue from the conferences indicated.

It is believed that it would be to the public interest for the officer in charge of public buildings and grounds to be authorized to become a member of the American Out-Door and Park Association; to attend the conventions; to exchange annual reports, and in other ways be a benefit to, and derive benefit from, the other park systems of the country.

THE FUTURE OF PARKS IN WASHINGTON.

The close of the nineteenth century is in one regard distinguished from all which have preceded it by the prominence given to the study of the social problem. Never in the history of the world has there



ELECTRIC FOUNTAIN PHOTOGRAPHED BY ITS OWN LIGHT.

been such a feeling of charity and good will so universally disseminated. This has shown itself in the very large amounts of money expended for charitable purposes, for the study and conquest of epidemic diseases, the increase and purification of water supply, the introduction and improvement of drainage systems, etc.

The hard lot of the toiling masses crowded together in cities and prevented by the struggle for life from improving their surroundings, has appealed to the growing kindliness of those more fortunate. More than one-half of the world's population lives in cities, where, in consequence, land has become too valuable not to be covered by buildings. This has resulted not only in intellectual degradation but in physical degeneration, and it has been recognized throughout the civilized world that for good health and happiness in life people must have a certain amount of contact with nature. Hence, the opening of the twentieth century is marked by a strong movement to introduce into crowded city life a little touch of the outside country.

Valuable properties have been bought in large cities and turned into parks, and there has been a very sensible increase in the number of small spaces in large cities left open and cultivated, so far as might be. No city in the world has as many of these small (and large) parklets as Washington, already available for the use of the present and of a very much denser population. It might be said, indeed, that the laying out of Washington City embodied an ideal toward which the charitable and benevolent efforts of the nineteenth century in this line have been directed. Provision has been made, as time passed by Congress, for the extension of this system, which is in every way beneficial to a population, not only physically and intellectually, but morally as well. While, however, the park lands of Washington have been kept and slightly added to during the past fifty years, Congress has not seen fit to develop, by appropriations for improvements, the latent possibilities of the park system in Washington.

With the close of one century and the opening of another—considering the unexpectedly new and grand future opening before us as the leading nation in the progress of humanity, charity, and good will toward all others—it is not only my duty, but it seems also a fitting time to call the particular attention of Congress to the needs of a greater liberality in developing and beautifying the parks of our capital city.

The so-called Potomac Flats will one day become a public park and form the western end of the beautiful system planned by the originators of the city, to extend from the Capitol to the Potomac River.

It should here be noted in passing, that the Botanical Garden logically belongs to this system, should eventually be thrown open, improved by walks and drives, and made a part of it.

Some day, probably, the Anacostia Flats will be improved, and proper provision should be made for additional parks in that section of the city. The eastern end of Pennsylvania avenue is susceptible of being made extraordinarily beautiful.

A proper regard for economy dictates that the parks in and around Washington should form a systematic and well considered whole, and it is not too early to provide for the study of this question. It is believed that an appropriation of $10,000, or so much thereof as might be found necessary, would be well spent in the study, mapping, laying out, and estimating for such a park system as has been indicated. Such a study at this time would lead to definite conclusions as to what is wanted, and economical foresight in providing therefor in the future. Should such an appropriation be made, this office is prepared to under-

take the work at once, since it has in its employ a competent and
landscape gardener, in the person of Mr. George H. Brown, who
made such work his life profession, and his ability in this line is
tically illustrated by the success already attained.

PARK CURBING.

It being the wish of Congress that the public parks should be inc
as little as possible, all the former high iron fences have been rem
except where absolutely needed. This left the edges of the parks
an unfinished appearance, in some cases unsightly. Congress ha
vided means in the past for placing a stone curbing around so
these parks, an improvement which is greatly needed in other p
particularly Franklin and Lincoln.

The accompanying drawing shows the various styles of park c
already in use throughout the city. The cost varies from $3 to $2
running foot. A moderate annual appropriation for this purpo
recommended.

MAINTENANCE OF IMPROVED PARKS.

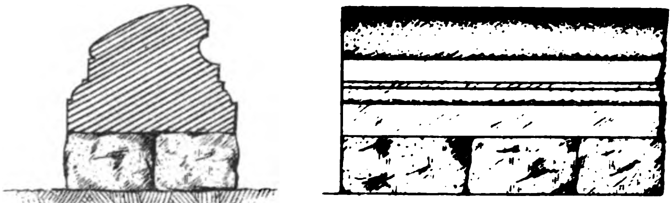
The improved parks and park spaces have been maintained in
condition during the year, the work consisting of mowing and ra
lawns, cleaning gutters and drain traps, edging the grassed margi
roads and walks, caring for flower beds, trees, and shrubbery, ga
ing up and removing rubbish, pruning trees and shrubbery, and sw
ing the paved walks through the parks and the pavements ar
them. Dead and unsightly trees and decaying shrubs have
removed, surfaces of gravel roads and walks repaired, raked and ro
board walks repaired, bare places on lawns seeded or sodded,
new sod laid along the margins of walks, caterpillars removed
trees, and elm trees sprayed to destroy the elm beetle; branch
trees overhanging roads and walks removed, drain pipes repaired
freed from stoppages, wire fencing placed around flower beds to pro
them, stake and wire fences to prevent trespassing erected, and
fences repaired.

All the summer bedding plants were removed from the flower b
in the early autumn, some of the beds replanted with chrysanthem
for fall bloom, and others with flowering bulbs and pansies for e
spring bloom. In the spring the beds, to the number of 210, w
planted with bedding plants for summer decoration.

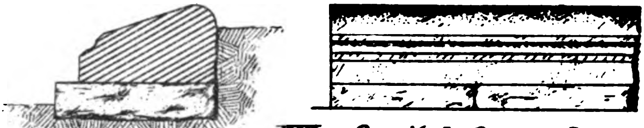
CHILDREN'S PLAYGROUNDS.

By the act of Congress approved August 30, 1890, the officer
charge of public grounds was authorized to set aside a portion of
public grounds for a children's playground, under regulations to
prescribed by him. The southern portion of the Monument Park w
at once set aside for this purpose, but no regulations were prescribe
as there were no means of carrying them out, no watchmen or polic
men having been authorized, and the service of the one watchman
duty at the Monument being needed there to protect the structu
from acts of vandalism.

Just complaints were received that the lawns were being destroye
trees injured, and that the children's playground was overrun by vi
ious and improper persons. This office has been requested to tak
action to relieve the grounds of such characters, and has been oblige
to call on the District police for assistance.



XIII. Capitol Grounds.



XIX. Capitol Grounds.

CORPS OF ENGINEERS U.S.ARMY.
Office of Public Buildings and Grounds
WASHINGTON, D.C.

SAMPLES
OF
STONE AND CEMENT COPING.

To accompany annual report of,
Theo. A. Bingham
June 30th 1899. *Col. U.S.Army.*

5 10 15 20
Scale of Inches.

Eng 56 1

To protect the improved grounds as far as possible, and to prevent serious annoyance to those enjoying the beauty of the park, the playground was transferred in the autumn of 1893 to the site between B street and the main drive north of the Monument. This plot of ground covers an area of about 8 acres and is occupied nearly all the time by men and boys playing football and baseball.

By the act of Congress approved March 2, 1895, the officer in charge of public buildings and grounds was directed to authorize the use of a portion of the grounds within the ellipse south of the Executive Mansion for a children's playground, under regulations to be prescribed by him.

Notice was given through the public press that children applying would be authorized to play lawn tennis, croquet, cricket, and kindred games. The only requirements were that the children should be recommended by any reputable citizen, and would agree to exercise the common rules of courtesy which would govern them in a private park.

But two requests were received for this privilege. Both were promptly granted, but in neither instance was advantage taken of the permit.

Several applications from young men to play football and baseball in the reservations were received, but it was not believed that it was intended under the law that the lawns of the ellipse or other parks should be used for these purposes.

It is proposed during the ensuing year to prepare reservation No. 126, at the intersection of Virginia and Georgia avenues and L street, between Ninth and Eleventh streets Southeast, as a playground. Not very much can be done with the money available, but the District Commissioners have agreed to curb the space and this office will level it off, roll it, put up a drinking fountain, and make it as available as possible.

These playgrounds should be set aside in various parts of the city for the use of children, not to be monopolized by grown persons or half-grown youths, nor to be used for games prohibited under the police regulations of the District.

Howard University Park, either highly improved or in its present condition, could well be selected for this purpose, and many of the smaller reservations throughout the city, which have not been highly improved, could be set aside for playing lawn tennis, croquet, and kindred games.

GROUNDS OF EXECUTIVE MANSION.

In addition to the usual work required for the care and maintenance of these grounds, the following has been accomplished: The asphalt semicircular roadway, leading from the entrances on Pennsylvania avenue to the north front of the mansion, has been repaired, and its entire area of 3,400 square yards covered with new asphalt wearing surface. Repairs were also made to the asphalt walks in the north and west parts of the grounds where cuts had been made for electric-wire conduits, the repairs covering an area of 12⅝ square yards. Eight iron posts, carrying electric arc lamps, were erected in September, 1898, the current being supplied through cables placed in terra-cotta conduits laid under ground. Six of these lamps are within the iron fence and two outside at the southeast and southwest corners of the grounds. These lights were erected and are maintained under contract. They have been lighted since September 21, 1898. In October all the flower beds were cleared of bedding plants, and 45 of them prepared and planted with spring flowering bulbs, requiring about 60,000 bulbs and plants. In the spring the bulbs were removed and the beds replanted with summer bedding plants. Over 50 beds were thus planted, requiring about 35,000 plants and bulbs in nearly 300 varieties and species. Eleven lamp posts and gas lanterns in the grounds and 13 on the sidewalk on the east, south, and west sides of the grounds were painted, and necessary repairs made to the iron fence inclosing the grounds. Some young trees and shrubs were planted, and necessary repairs made to the three large fountains in the grounds. The sectional band platform used by the Marine Band at the Saturday afternoon concerts, given in these grounds during the summer, has been enlarged by the construction of 12 additional sections, containing 700 square feet, and 13 additional trestles for supporting same.

In accordance with the usual custom, the grounds were thrown open to the children on Easter Monday, April 3. In order to protect them from injury temporary wire fencing was placed around all flower beds, small trees and shrubs, and the large fountain. But little damage was done to the trees and shrubs, but the grounds were badly littered and considerable damage done to lawn surfaces. The cost of erecting and removing wire fencing, cleaning up the grounds, and resodding or seeding bare places on lawns where the grass was destroyed by the tramping of the crowd over it, was about $160.

PROPAGATING GARDENS, INCLUDING THE GREENHOUSES AND NURSERY.

Necessary repairs were made to the various greenhouses during the year and the large and valuable collection of plants was maintained in good condition.

Repairs were made to decayed woodwork in the greenhouses, such as sashes, doors, posts, rafters, wall plates and staging, coal bins, and board walks, and all the new woodwork painted. The flues of all boilers were opened and cleaned, the fronts of boilers and furnaces painted, boilers repaired, and joints of heating pipes repacked. The roofs of nine greenhouses and some of the sashes of other houses were reglazed and all broken glass replaced with new glass. New tin gutters and down spouts and new galvanized iron gutters were made and placed on some of the houses and painted, and the roof of a potting shed covered with tin. The interior woodwork and ironwork of two greenhouses, and the roofs of six greenhouses, two potting houses, and four potting sheds have been painted and some drainpipe laid. A shed for storing a steam road roller was built and one of the frame potting sheds extended.

A new greenhouse building, 112 feet long, 25 feet wide, and 16 feet high was built during the year.

A pit addition to the propagating house was also constructed. It has brick walls, is 130 feet long, 12 feet wide, and 3 feet high, and is heated by 262 feet of 2-inch and 816 feet of 1¼-inch hot-water pipe connected with the boiler of the propagating house. With the exception of the flagstone for the walks, the pit was built with old materials from a greenhouse of the Treasury Department transferred to this office without expense by that Department.

A cold frame, 112 feet long and 7 feet 6 inches wide, was also constructed.

There were propagated during the year 720,053 park bedding plants of over 50 kinds and 284 varieties.

There were purchased during the year, under contract, 74,200 bulbs for winter forcing in the greenhouses and for fall planting and early spring bloom in the parks. There were also purchased 1,123 plants.

The following plants were grown in the greenhouses for fall, winter, and spring bloom: 3,135 smilax plants, 1,542 carnations, 80 alyssum, 1,807 roses, 2,136 violets, and 3,450 chrysanthemums for stock and fall flowering—in all, 12,150.

There were potted and boxed for winter forcing the following bulbs: 4,305 freesia, 2,000 narcissus, 700 liliums, 8,000 Roman hyacinths, 3,000 Dutch hyacinths, 5,000 tulips, and 2,500 pips lily of the valley.

There were sent out to the parks, for fall planting, 9,794 chrysanthemum plants, and for early spring flowering, 86,259 bulbs, and 5,874 pansy plants for early spring bloom.

In April, May, and June, 679,862 bedding plants and 3,072 tropical plants were sent out for summer planting in the parks; 26 vases in the parks were stocked with plants and water lilies planted in the basins of some of the fountains; 19,718 bedding plants and 290 roses were furnished for the grounds of public buildings; 18,337 bedding plants and 60 roses to hospitals and charitable institutions, and the remaining odds and ends of surplus bedding plants left over from the spring planting of the parks were given to whoever applied for them.

In the nursery grounds the lawns were mown as often as needed during the growing season, roads, walks, gutters, and grounds maintained in a cleanly condition, and the young stock cared for; a survey of the propagating gardens was made and work commenced preparing a map of the same; 17,753 miscellaneous plants and 1,625 bulbs were planted for stock and for early spring and summer bloom, and 3,710 chrysanthemum plants set out for fall planting in the parks; 390 trees and 475 shrubs were purchased; 759 young flowering shrubs and 152 young trees were taken up and planted in the parks, and trees and shrubs in the nursery transplanted as required.

Extensive improvements can well be made at these gardens. About 700,000 plants are annually propagated at the greenhouses for use in the summer and autumn decorations of the public parks. The beautiful water lilies and other aquatic plants used in many of the fountain basins are also propagated here.

The various structures are serviceable for the purposes for which they are used, and have been mainly erected by our own workmen, at comparatively cheap cost. They are without ornamentation of any kind, and are maintained in repair by a small annual appropriation of $2,000. The buildings should be increased in number. A large storehouse, palm house, and subtropical-plant house are especially needed. Greenhouse pits and cold frames are also required for the purpose of growing hardy herbaceous perennials, no plantings of which, of any magnitude, have as yet been made in any of the parks or other public gardens in Washington.

By the courtesy of Colonel Allen, the engineer officer in charge of filling the Potomac Flats, which when filled are by law to be used as a public park, and by authority of the Chief of Engineers, greatly needed additional space has been added temporarily to the propagating gardens, and he has also transferred temporarily to this office the needed space for storage and compost heaps at the foot of Eighteenth and Nineteenth streets NW.

This office is frequently in receipt of requests for the loan of plants from the gardens for the use of churches, fairs, festivals, etc., and demands are constantly made for flowering and decorative plants for private purposes.

All such requests have to be declined, as either the loan or gift of any plants would be in violation of the following extract from the act of Congress approved June 20, 1878:

> *Provided*, That hereafter only such trees, shrubs, and plants shall be propagated at the greenhouses and nursery as are suitable for planting in the public reservations, to which purpose only the said productions of the greenhouses and nursery shall be applied.

After the annual spring planting in the parks is completed, it sometimes happens that there is a small surplus of bedding plants on hand. These are divided among such public reservations or institutions as the State, War, and Navy building, Marine Barracks, Washington Aqueduct grounds, Fort Myer Military Reservation, and various hospitals and orphan asylums. After these are supplied, should there still be a few such surplus plants remaining, they are given to whoever may ask for them.

This office now furnishes, after its park planting is completed, many plants and shrubs for beautifying the grounds of the various Executive Departments, the labor in planting and care being furnished by each Department.

As we propagate nearly three-quarters of a million plants every year, at a cost of less than 3 cents apiece, the results obtained would be much finer if this department had a slight increase of funds for caring for all the Executive Department grounds together. We have a force of skilled workmen which would need but slight increase over present numbers to propagate for all the Departments, plant and care for the flowers and shrubs, and better results would be obtained for less actual cost to the Government than now, when several small and rather untrained forces of men do this work.

If an appropriation of, say, $400 only were made for each Executive Department, the total of only $2,800 would enable this extra work to be done, which is quite in the line of systematic administration.

RESERVATIONS NORTH OF PENNSYLVANIA AVENUE AND WEST OF THE CAPITOL.

This division of the city embraces all the public reservations located between First and Twenty-eighth streets west and B street and Florida avenue north, the majority of which are in an advanced condition of improvement and require the constant attention of a force of skilled laborers for their proper maintenance.

It includes the highly improved parks known as Washington circle, Rawlins square, Du Pont circle, Scott circle, Lafayette square, Franklin square, Farragut square, McPherson square, Mount Vernon square, Iowa circle, Thomas circle, Judiciary square, and a number of other smaller highly improved reservations.

In addition to the work required for the care and maintenance of the improved parks and park places in this division, the following has been accomplished:

Du Pont circle.—Repairs were made to the asphalt walks, the repairs covering an area of 375 square yards. Owing to the erection of electric lights near the circle by the District government, the lighting of eight gas lamps by this office in the line of post-and-chain fence inclosing the reservation became unnecessary after the 25th of September, and they were accordingly dispensed with and the burners removed. Gas pipe was run into the watchman's lodge for the purpose of lighting same.

Farragut Park.—Bare places on the lawns were resodded, 1,016 square yards of sod having been used for the purpose; bare places not resodded were sown with grass seed. Repairs were made to worn places in the asphalt walks, 56 square yards having been resurfaced with new asphalt. The post-and-chain fence inclosing the park was painted.

Franklin Park.—Bare places on lawn surfaces were loosened and sown with rye and grass seed. Forty-three square yards of asphalt walk were resurfaced where the old surface had become worn and broken. In January and February the lawns were covered with manure compost, 158 cart loads having been used for the purpose.

Iowa circle.—The mound around the base of the pedestal of the statue of General Logan was sodded, 216 square yards of sod being laid. Repairs were made to the asphalt walks where required; 22 square yards were resurfaced.

Judiciary Park.—The asphalt pavement on the F street roadway through this park was extended out to Fifth street, the area of gravel road paved amounting to 540 square yards. This entire roadway is now covered with an asphalt pavement. The gravel roadway on the line of E street was also paved with asphalt from the entrance on Fourth street for about half its length through the park, the area covered amounting to 994 square yards. A granite block apron, 26 feet long by 2½ feet wide, was laid across the end of the new asphalt pavement on E-street roadway to make a good junction with the adjoining gravel surface. Repairs were made to worn portions of the asphalt walks in this park, an area of 200 square yards having been resurfaced. The gravel removed from that portion of the E-street roadway which was paved with asphalt was used in repairing and resurfacing the gravel surface of the remainder of that roadway out to Fifth street. The chain barricade across the center roadway was removed and ten iron posts set, placed 6 feet apart, to prevent the passage of vehicles. The cobblestone gutters on the sides of the new asphalt roadway were repaired. The narrow strip of gravel at each side of the asphalt walk leading from the Pension Bureau building to Fourth and E streets was paved with cobblestones for a distance of 167 feet.

Lafayette Park.—Worn places in the asphalt walks were repaired, an area of 112 square yards having been resurfaced. A new sewer was laid in the south side of the park, running from the entrance at the southeast corner to the center (Sixteenth street) entrance from Pennsylvania avenue. In this work 262 feet of 12-inch, 60 feet of 8-inch, and 24 feet of 6-inch terra-cotta drain pipe were used, and two brick catch basins each 2 feet square constructed. The iron railing around the Jackson statue and the four gun carriages within were painted.

Mount Vernon Park.—The gravel walk in this park leading from the southwest-corner entrance to the center walk was paved with asphalt, the area covered amounting to 77 square yards.

The act of Congress approved March 3, 1899 (Public—No. 219), selects this square as the site for a building to be erected for the Washington Public Library.

President's Park (south of the Treasury Department, Executive Mansion grounds, and State, War, and Navy Departments).—The gravel roadway between the Executive Mansion and the State, War, and Navy building was resurfaced with fresh gravel, and an apron of granite blocks 42 feet long and 2½ feet wide laid across its entrance from Pennsylvania avenue.

Repairs were also made to other portions of the gravel roadways in the park; the entire work required 479 cubic yards of gravel, which was purchased under contract. Worn portions of the walks at the northeast corner of the park were repaired with gravel removed from two reservations on Pennsylvania avenue, whose walks were paved with asphalt. The photograph building in the northeast corner of the grounds and the greenhouse structure in rear of the same, both belonging to the Treasury Department and which stood on the site of the Sherman statue, were transferred to this office by that Department, the buildings taken down by employees of this office, and the materials hauled to the storage yards at the nursery. A cobblestone gutter 48 feet long and 18 inches wide, grouted with cement, was laid at the east side of the Executive Mansion stable, in the northwest corner of the park, and a new draintrap constructed and connected by 30 feet of 4-inch iron drainpipe, with the drainpipe from stable for carrying off surface water from low ground on north side of the building; 72 large trees and 203 flowering shrubs were planted outside of the belt of trees growing around this stable and the stable of public buildings in the rear. A plank walk 225 feet long and 3 feet wide was constructed in the northeast corner of the park.

Scott Circle.—The curb and gutterway on the east side of the mound around the Scott statue were raised where they had settled below grade over a sewer, and some of the flagstones in the sidewalk around the circle were also raised and relaid.

Thomas Circle.—Manure compost was spread over the lawn surface in February.

Washington Circle.—In order that the statue of General Washington may be seen from Pennsylvania and New Hampshire avenues vistas were opened up by cutting off branches of large shade trees and pruning them into proper shape.

Reservation 28, Pennsylvania avenue, Twenty-first and I streets, NW.—The gravel walks through this triangular reservation were paved with asphalt, the area covered amounting to 293 square yards.

Reservation 31, Pennsylvania avenue, Eighteenth and H streets, NW.—The gravel walks in this triangle were paved with asphalt over a surface of 268 square yards.

Reservation 32, Pennsylvania avenue, Fourteenth and E streets, NW.—All of the large shade trees in this reservation which were damaged by the burning of the power house of the Capital Traction Company opposite the reservation, in September, 1897, were removed. Dead and unsightly shrubs were removed and 70 flowering shrubs planted.

Reservation 33, Pennsylvania avenue, Thirteenth and E streets, NW.—Dead and unsightly shrubs were removed and 56 flowering shrubs planted.

Reservation 36, Pennsylvania avenue, Seventh and C streets, NW.—Dead and unsightly groups of shrubbery were removed and 75 flowering shrubs and 2 low-growing trees planted.

Reservation 61, Massachusetts avenue, Nineteenth and P streets, NW.—Soil removed in improving reservation 140 was hauled to this reservation and spread over its surface, which is below the grade of surrounding walks.

Reservation 140, New Hampshire avenue, Twenty-first and M streets, NW.—The margins of this reservation were lowered to conform to the grade of the new cement sidewalk recently constructed around it by the Commissioners of the District, and the uneven surfaces graded. Pipe was laid for introducing water into the reservation. Trespass paths over lawn were broken up, bare ground sown down in grass seed, a border of new sod 2 feet wide laid around the boundary of the reservation, and 11 ornamental trees and 110 flowering shrubs planted.

Reservation 150, Connecticut avenue, Eighteenth and M streets, NW.—Twenty-two flowering shrubs have been planted.

Reservation 172, New York avenue, Thirteenth and H streets, N W.—Three ornamental trees and 25 flowering shrubs have been planted.

RESERVATIONS IN SOUTHWEST DIVISION.

This division of the public grounds embraces the area lying between First and Seventeenth streets west and B street north, and includes the large and important parks known as Henry and Seaton parks, the Smithsonian grounds, and Monument grounds.

The usual annual work required for maintaining the improved reservations in good condition was performed.

The following special work was also accomplished:

Henry Park.—Worn places in the roads were repaired with fresh gravel; an asphalt pavement 218 feet long and 6 feet wide, covering an area of 148 square yards, was laid on the gravel walk leading into the park from B street south midway between Sixth and Seventh streets west and connecting with the asphalt walk on the south side of the roadway running through the park near the Fish Commission building; 30 sections of the high iron fence on the north side of the grounds from Seventh street east to the Baltimore and Potomac Railroad station, were scraped, repaired, and repainted.

Monument grounds.—The gravel roadways were repaired, 418 cubic yards of fresh gravel being purchased under contract and used in the work. Thirty-eight feet of cobblestone gutter 2 feet wide were laid in the east side of the roadway at the entrance to the grounds at Fifteenth and B streets northwest, to prevent washouts in the roadway. The ground on the west side of the "Jefferson" pier was sloped so as to show the inscription on the pier. About 4 square yards of the slope were paved with small cobblestones and 4-inch pipe laid for a distance of 26 feet for drainage; 660 feet of 12-inch and 25 feet of 8-inch terra cotta drainpipe for surface drainage, and 295 feet of 2-inch and 35 feet of 1¼-inch water pipe, with a 2-inch gate valve and 1¼ hose valve, for irrigating purposes, were laid on the line of roadway entering from B street in the northwest portion of the grounds. A new board walk 500 feet long and 4 feet wide was laid leading toward the Monument from the roadway in eastern part of the grounds, and old board walks were taken up, new crosspieces put down, and the walks replaced. The iron fence on the north side of the grounds from Fourteenth to Fifteenth streets was repaired, scraped, and painted. Twelve iron poles, each with an arc electric lamp, were erected in these grounds, and the lamps lighted from September 22. The current for these lamps is supplied through wires placed in terra-cotta conduits laid underground. The lighting of the one gas lamp in these grounds, located at the entrance to the nursery, was discontinued as soon as the electric lights were in operation. Permission was granted the Commissioners of the District to deposit snow removed from the streets during the past winter upon the unimproved ground in this park immediately south of B street north. The ruts made by the vehicles hauling this snow were filled up and the ground leveled by workmen employed by the Commissioners.

Seaton Park.—Two square yards of cobblestone pavement were laid at the entrance to the trap basin on the south side of the road near Third street to prevent washouts at that place.

Smithsonian grounds.—Repairs were made to worn places in the asphalt roads in the park, the area resurfaced amounting to 620 square yards. A watchman's small lodge house removed from Dupont circle was placed in these grounds near the entrance at Tenth and B streets. Nine new flower beds were made. The post and chain fence on the south boundary line of the park, in rear of the National Museum building, was repaired, and 25 iron posts and chains in this fence were painted, and the high iron fence on the north side of the grounds from Seventh to Twelfth streets NW. was repaired and painted; 25 iron park posts, 62 gas lamp-posts and lamps, and one drinking fountain and lamp-post combined in the park were also painted.

Reservation 111, Virginia avenue, Twelfth and B streets, SW.—The iron post and chain fence inclosing this reservation was repaired and painted.

Reservation 113, Maryland and Virginia avenues, between Seventh and Ninth streets, SW.—Extensive repairs were made to the posts of the post-and-chain fence inclosing this reservation, and it was painted.

Reservation 293, Canal, First, and N streets, SW.—This reservation has long been occupied in violation of law by a party who built a frame house thereon in 1888. The case was placed in the hands of the United States district attorney for the District of Columbia in 1892. On March 19, 1897, the supreme court of the District rendered an opinion that the said party was a trespasser and unlawfully occupying the reservation, and ordered and decreed that he remove all buildings, fences, and other obstructions from the grounds within thirty days and deliver the said premises to the possession of the Superintendent of Public Buildings and Grounds. From this decree the trespasser appealed, but his appeal was dismissed on October 5, 1897, and he was ordered to perform the decree of March 19, 1897, on or before the 1st day of December, 1897. This he has not done, and on the 13th of September, 1898, the United States marshal entered upon the premises, dispossessed the occupant of the house, and turned the property and the keys of the building over to this office. The question of the disposition to be made of the building is still under consideration.

RESERVATIONS EAST AND SOUTH OF THE CAPITOL.

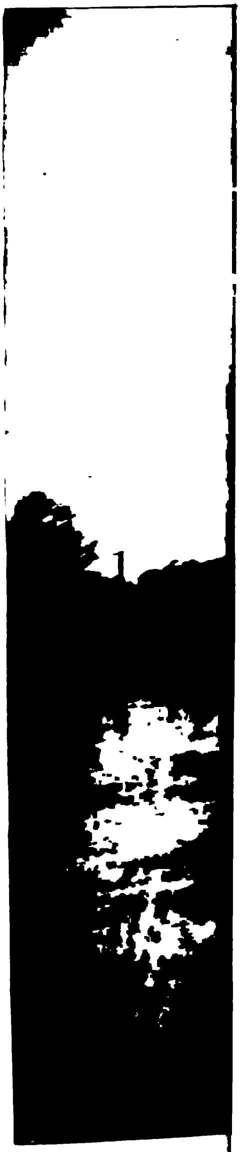
This division of the city includes within its limits the highly improved reservations known as Lincoln, Garfield, Folger, Stanton, and Marion parks.

In addition to the general work required for the care of the improved parks and park places in this division, the following special work was accomplished:

Folger Park.—A new drain 180 feet long of 4-inch iron pipe has been laid from the fountain in this park.

Garfield Park.—Repairs were made to the gravel roadways, 131 cart loads of gravel having been used for the purpose. Necessary repairs were made to sewer pipes. Work was commenced in June by workmen employed by the District government grading the ground over the large public sewer which has been constructed through this park during the past two years, and repairing and restoring the roads, walks, and gutters which were crossed by the sewer. One of the roads which had been closed during the progress of work on this sewer was opened to travel in September.

Lincoln Park.—Three hundred and eight square yards of additional asphalt foot walk were laid on the gravel walk leading into the park from the southwest entrance, and two new entrance walks of gravel were constructed at the east end of the park, one on the north side and one on the south side and connected with intersecting walks. Each of



these new walks is 40 feet long and 7 feet wide. Low places in the walks where rain water lodged were excavated, filled with stone, and covered with a light coating of gravel.

Stanton Park.—An asphalt pavement 5 feet wide was laid on the gravel walk leading in from Fifth street around by the east side of the center mound from the north entrance to the south entrance, the area paved amounting to 149 square yards. The watchman's lodge was painted. Low places in the walks were excavated, filled with stone, and covered with a light coating of gravel.

Reservation 65, Massachusetts avenue, Eighth and B streets, NE.—A flower bed 18 feet in diameter was constructed in this reservation and planted with chrysanthemums in the autumn and summer bedding plants in the spring.

Reservation 85, Massachusetts avenue, Eighth and B streets, NE.—A flagstone walk 3 feet wide and 100 feet long was laid across the base (east side) of this reservation, connecting the sidewalk on B street with that on Massachusetts avenue. A brick manhole over a sewer running through the reservation was raised 2 feet to bring it to the proper grade. Pipe was laid for introducing water into the reservation.

Reservation 207, Maryland avenue, Seventh and D streets, NE.—A flower bed 20 feet in diameter was made and 65 shrubs planted. Pipe for introducing water into the reservation was laid.

Reservation 211, Maryland avenue, Twelfth and F streets, NE.—Forty-eight shrubs were planted.

Lots 13 and 14 in square 959.—This office has always held that these lots were the property of the United States—although they have been claimed from time to time by private parties—and the title of the National Goverment in them was recognized by Congress in the act approved March 3, 1899, which reads as follows:

AN ACT to confirm title to lots thirteen and fourteen, in square nine hundred and fifty-nine, in Washinton, District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and he is hereby, authorized and directed to release and quitclaim to Thomas Yates, his heirs and assigns forever, all the right, title, and interest, whether legal or equitable, of the United States of America in and to all those lots or parcels of ground situated in the city of Washington, District of Columbia, and known on the ground plan of said city as lots numbered thirteen and fourteen, in square nine hundred and fifty-nine, upon the payment by the said Thomas Yates of such a sum as the said Secretary of the Interior shall deem just and equitable: *Provided,* That the said Thomas Yates pay to the proper officer of the District of Columbia all taxes heretofore assessed against said property, both general and special now unpaid and standing against said property.

MARKING UNIMPROVED RESERVATIONS.

One hundred small granite blocks were cut and squared and 141 marked with the letters U. S. cut in their upper sufaces for use in marking unimproved and partially improved reservations to show that they are the property of the United States.

During the year the following reservations were marked with these stones set in the ground at their corners:

Reservations 162, 164, 165, 166, 167, 168, 169, and 273 on Vermont avenue between Ninth and Fourteenth streets NW.

Reservations 215, 216, 218, 219, and 220 on Delaware avenue between H and N streets SW.

Reservations 272, 274, 275, 276, and 278 on Florida avenue between First street NE. and Tenth street NW.

Eighteen reservations in all were thus marked, requiring 55 stones.

SETTEES, TOOLS, MANURE, REPAIR OF POST AND CHAIN FENCES AND REMOVING SNOW AND ICE.

During the year 146 park settees were repaired and 267 painted. All settees in the parks were examined, and those found loose were refastened to the ground with stakes and wire.

Repairs were made to lawn mowers, wheelbarrows, and miscellaneous tools, edged tools sharpened and kept in good order, and new tools purchased from time to time as required. A steam road roller was purchased.

About 718 cubic yards of stable manure, 103 cubic yards of soil, 95 cubic yards of cow manure, and 287 cubic yards of potting sod were purchased, the soil and the greater part of the stable manure mixed into compost and spread over the lawns of various parks and around young trees and shrubbery, part of the stable manure used in enriching flower beds, and the cow manure and potting sod made into potting compost for plants; 630 feet of pipe were laid for introducing water into the compost grounds at the foot of Eighteenth and Nineteenth streets NW.

Repairs were made to the high iron fences, new caps placed on the iron posts of post and chain fences to replace broken and missing caps, and repairs made to the chains in these fences where required.

The snow and ice were removed as soon as possible after storms from the walks through and sidewalks around the various parks and park places. The snowfall was unprecedentedly heavy, that in February alone being 35.2 inches, as reported by the Weather Bureau, and the regular appropriation of $1,200 was entirely exhausted by February 8. On February 11 Congress made an additional appropriation of $2,000, all of which was required and used, with the exception of the small sum of $144, which will be returned to the Treasury.

PAINTING WATCHMEN'S LODGES, IRON FENCES, VASES, LAMPS, AND LAMP-POSTS.

Eight of the watchmen's lodges and the interior of one, 306 sections of the high iron fence on the north side of Henry Park, Smithsonian grounds and Monument grounds; the iron railing around the statue of General Jackson in Lafayette Square and the four gun carriages within the railing; iron posts and chain fences inclosing Lincoln Park, Judiciary Park, and 40 of the small reservations, consisting of 2,422 posts and chains and 214 posts and bars; 216 lamp-posts; 214 gas lamps; 25 iron park posts, and 18 flower vases. were painted and 3 flower vases bronzed.

WATER PIPES AND FOUNTAINS.

Repairs have been made to water pipes and valves from time to time when necessary. In the autumn the water was shut off from the various parks, the hose valves removed, stored in the shops at the nursery, and repaired and repacked during the winter where required. In the spring the valves were replaced in the parks. During the year the water pipes in the public grounds were extended by laying 417 feet of 2-inch, 750 feet of 1¼-inch, and 96 feet of 1-inch pipe and placing the necessary valves. Nineteen old iron extension boxes over stop valves were replaced with new boxes, the valves repacked wherever necessary, and a new stop valve placed in one reservation and an iron extension box over it.

There are 21 small fountains with basins in charge of this office. Repairs were made to the cement basins of these fountains wherever needed, and they were cleaned out, stone copings repointed, stains removed from them, and the supply and waste pipes and valves maintained in order. The jets, which, with a few exceptions, are of very simple character, were removed from the fountains in the autumn, the water turned off, jets requiring it repaired, and all replaced in the spring. Two of the fountains were painted.

There are 24 drinking fountains in the various parks, and these have been maintained in good order and repairs made when necessary. At the approach of winter the water was shut off and the dippers removed. In the spring the dippers were replaced and the water turned on. Eighteen of the fountains were repainted during the year.

LIGHTING THE PUBLIC GROUNDS.

The following parks are lighted with arc electric lights: Executive Mansion grounds, 8 lights; President's Park, 9 lights; Monument Park, 12 lights; Lafayette Park, 6 lights; Franklin Park, 9 lights; Judiciary Park, 9 lights; Lincoln Park, 8 lights; a total of 61 lights. Eight of the lights in the Executive Mansion grounds and the 12 lights in the Monument Park were installed in September. The lighting of 1 gas lamp in the Monument Park and 8 at Dupont circle were discontinued in September, being superseded by electric lights, as mentioned elsewhere in this report.

The number of gas lamps not connected with meters lighted nightly during the year was 255 from July to September and 246 from October to June. Each of these lamps burned about 3,000 hours and consumed about 15,000 cubic feet of gas.

In addition to the gas lamps mentioned in the foregoing paragraph, there are 71 burners in the Executive Mansion grounds connected with the meters in the Mansion.

The lamps have been maintained in good condition and minor repairs made from time to time as required.

It is earnestly hoped that the system of lighting the public grounds by electricity will be extended to the Smithsonian grounds and to the various improved parks throughout the city.

Construction and repair of asphalt pavements.

The following tabulated statement shows the area of asphalt roadway and foot-walk pavement constructed and repaired during the year:

Locality.	New roadway.			Repairs to roadways.	New walks.			Repairs to walks.
	Length.	Breadth.	Area.		Length.	Breadth.	Area.	
	Feet.	*Feet.*	*Sq. yds.*	*Sq. yds.*	*Feet.*	*Feet.*	*Sq. yds.*	*Sq. yds.*
Reservation 28, Pennsylvania avenue, 21st and I streets NW	....	....	....	....	526	5	293	....
Reservation 31, Pennsylvania avenue, 18th and H streets NW	....	....	....	....	480	5	268	....
Grounds north of Executive Mansion	....	....	....	3,400	....	....	....	12.67
Lafayette Park	....	....	....	....	....	....	....	112
Franklin Park	....	....	....	....	....	....	....	43
Farragut Park	....	....	....	....	....	....	....	56
Iowa circle	....	....	....	....	....	....	....	22
Dupont circle	....	....	....	....	....	....	....	375
Mount Vernon Park	....	....	....	....	137	5	77	....
Judiciary Park	343 200	26 24	994 540	....	....	....	....	200
Smithsonian grounds	....	....	....	620	....	....	....	....
Stanton Park	....	....	....	....	266	5	149	....
Lincoln Park	....	....	....	....	552	5	308	....
Henry Park	....	....	....	....	218	6	148	....
Roadway on east and south sides of State, War, and Navy Department building	812 360	47.7 45.2	6,200	....	....	....	....	....
Total	1,715	....	7,734	4,020	2,179	....	1,243	820.67

DEPARTMENTAL TELEGRAPH LINE.

The telegraph lines now under control of this office are as follows:

The line of overhead wires consists of 82 poles, covering a distance of about 3½ miles, with a length of about 16 miles of wire. This line, starting from the State, War, and Navy building, runs to the Executive Mansion, thence to the Treasury Department, thence to G street, thence to Eighth street, thence to H street, thence to North Capitol street, and thence to the Capitol. Connected with it is one running from the Treasury Department along Fourteenth street to the Bureau of Engraving and Printing and Agricultural Department, and one down Fifth street to the Pension building. There are about 500 feet of 13-conductor Patterson cable running from the cable pole in the Capitol grounds into the basement of the Senate, and 250 feet of 20-conductor cable running from the cable pole on the corner of Seventeenth and G streets into the State, War, and Navy building.

During the year the main and local batteries received necessary attention, and were maintained in good working order. All crosses and other obstructions on the wires of the line were removed as soon as possible, and instruments were maintained in good condition.

Two new wires, 8 miles, were run for the purpose of making a metallic circuit of the line. The entire line was gone over, the cross arms braced with iron braces, and four of the new poles, erected prior to July 1, supplied with stepping irons. About 1 mile of worn-out iron wire was removed and replaced with weatherproof insulated copper wire.

In March permission was given the Commissioners of the District of Columbia to place two wires on three of the departmental telegraph poles on H street east of Third street NW., for the use of the District fire-alarm service.

Permission was also given to the Chesapeake and Potomac Telephone Company, in April, to replace at its own expense a 62-foot pole of the Government line on H street, between Fifth and Sixth streets, with a 72-foot pole, in order that the Government wires might be carried high enough to clear the company's wires at that point.

The old cables laid by the Standard Underground Cable Company in 1883 on B street NW., for experimental purposes for the departmental telegraph line, and afterwards paid for by the United States, the use of which has long since been abandoned, were, by permission of this office, taken up in March and April by workmen in the employ of the District government, to permit of the street being graded, and sent to the property yard at the nursery. Twenty-six coils of this cable were received at the yard and stored.

The wires running from Fourteenth street to the Department of Agriculture and the wires on the roof of the Treasury Department were pulled up, the slack cut out, fixtures braced, and wires replaced. The fixture on roof of the Interior Department which had pulled loose was fastened in place and the wires tightened and replaced. The fixture and wires on the roof of the Department of Agriculture were broken down by high winds in March; the fixture was replaced and securely braced and the wires repaired. The local battery in the Executive Mansion was moved from the attic to the basement of the building, the necessary wires run, and connections made.

The Department of Justice having moved from its building at Pennsylvania avenue and Madison place NW. to a building on K street, between Vermont avenue and Fifteenth street, the telegraph office of the Department was moved under the supervision of the lineman of this office, the extra labor and necessary materials being furnished by that Department.

A new conduit having been constructed in the Capitol grounds, the cables were transferred to it from the old conduit, the cables in the Capitol building carefully gone over, placed securely in position, and necessary connections made with the telegraph offices in the Senate and House. A fire which occurred in the Capitol in November destroyed about 600 feet of 6-conductor cable, cutting off all communication with the House of Representatives. New wires were run as rapidly as possible and the work completed in time for the assembling of Congress in December. The wires used for making connection with the office in the Senate, which were run up a hot air flue, were found to be useless owing to the burning off of the insulation; a new route was selected, a new 15-wire cable run from the basement to the office on the first floor, and the necessary connections made. During the recess of Congress the offices in the Senate and House were closed, the wires disconnected, and the instruments cared for.

The wires of the line were broken down by the blizzard in February; they were replaced and put in order as soon as possible.

This only accentuates the necessity for replacing the poles with a system of underground cables, which is so apparent that argument in its favor is unnecessary.

Estimates have been carefully prepared and submitted in previous years. The cost of the underground system will be $25,000, and the matter is presented for such action as Congress may deem best.

OLD RECORDS OF THE CITY OF WASHINGTON.

On January 27, 1898, the United States Senate passed a resolution directing the Secretary of War to transmit to the Senate at as early a date as possible the numbers and locations of all lots in the District of Columbia the title to which the records in the office of the Commissioner of Public Buildings and Grounds show to be in the United States; also report of all lots in the District of Columbia sold or donated by the United States, the numbers of the squares in which such lots are located, the date of sale, the names of purchasers, and the amounts received.

A copy of the resolution was referred to this office on January 28 from the office of the Chief of Engineers, with request for early report, and on May 21, 1898, there was sent to the Chief of Engineers, in partial compliance with the requirements of the resolution, the following:

(1) List of lots in the city of Washington, D. C., the title to which the records of this office show to be in the United States, there being no record of the sale of said lots; and

(2) List of lots in the city of Washington, D. C., which are shown by the records of this office to have been donated by the United States.

On December 22, 1898, there was sent to the Chief of Engineers in further compliance with the resolution a partial "list of all lots in the District of Columbia sold by the United States, compiled from old records in the Office of Public Buildings and Grounds," and covering squares numbered from 1 to 245, consecutively. There are in all about 1,200 squares to be reported on, and it is anticipated that before the assembling of Congress in December, 1899, a further report will be ready for submission, covering more than 400 additional squares.

The act of Congress approved March 3, 1899, provided:

> SEC. 2. That the Secretary of War be, and he is hereby, authorized and directed to correct the records of the War Department in respect of any of the lots mentioned in Senate Document Numbered Two hundred and seventy-seven, Fifty-fifth Congress, second session (being a letter from the Secretary of War transmitting, in compliance with the resolution of the Senate of January twenty-seventh, eighteen hundred and ninety-eight, a letter from the Chief of Engineers, together with list of lots in the city of Washington, District of Columbia, the title to which the records of his office show to be in the United States, and list of lots in the city of Washington, District of Columbia, which are shown by the records of his office to have been donated by the United States), upon the filing by an actual occupant of any of the lots mentioned in said document sufficient proof that the said occupant or the party under whom he claims has been in actual possession of the said lot or lots for an uninterrupted period of twenty years, so that said records shall show the title to said lots to be in the said occupant.

Between the date of that act and June 30, 1899, the required proof has been furnished by the occupant, and the records corrected in the case of only one of the lots so far as this office is informed, the title to which was shown by the record to be in the United States.

EXTENSIONS OF BUILDINGS BEYOND THE BUILDING LINES IN THE CITY OF WASHINGTON.

The act of Congress approved March 3, 1891 (vol. 26, Stat. L., p. 868), provides that no permits shall hereafter be granted for the extension of buildings beyond the building line except with the concurrent approval of the Secretary of War..

This office, by direction of the Secretary of War, is charged with investigation and report on these cases. During the fiscal year ending June 30, 1899, 454 applications have been referred from the War Department to, and reported upon by this office.

RESERVATIONS, WHICH ARE THE PROPERTY OF THE UNITED STATES, OCCUPIED, IT IS BELIEVED, IN VIOLATION OF LAW.

[See map in Annual Report for 1894.]

The following reservations, claimed as the property of the United States, are now occupied, it is believed, without authority of law:

Reservations Nos. 113, 127, and 197, by the Baltimore and Potomac Railroad Company.

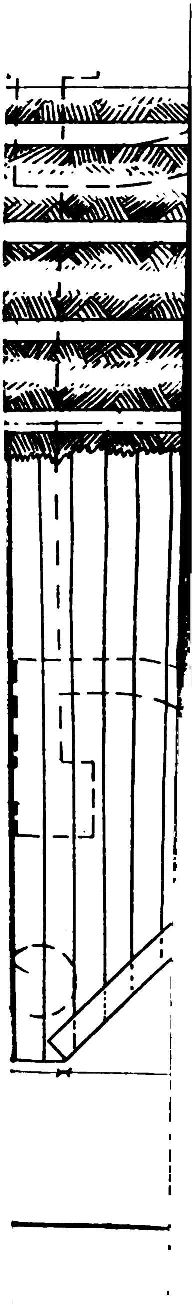
Reservation No. 226, by the Baltimore and Ohio Railroad Company. This reservation has been occupied since 1884 by a large derrick and used as a yard. No record of proper authority therefor can be found. The matter has time and again been reported in the annual reports of my predecessor, and has also been reported to the law officers of the Government. The members of the Northeast Washington Citizens' Association have lately made a renewed effort to have this reservation restored to the United States and improved for the beautifying of that part of the city.

Reservation No. 125, by the Central Union Mission, as a place of worship.

Reservation No. 186, by the Bethany Chapel of the New York Avenue Presbyterian congregation.

Reservation No. 249 is occupied as a lumber yard by a party who claims to rent it from a gentleman in Port Deposit, Md.

Reservations Nos. 137, 138, 141, 152, 164, and 169 have been inclosed with iron or wire fences and partially improved by the owners of adjacent property.



The following also are improved and utilized by adjacent property owners: Nos. 65, 67, 139, 143, 161, 162, 167, 168, 175, 208, and 284.

STATUES.

There are 17 statues in the national public grounds under charge of this office, as follows:

Daguerre, Admiral Du Pont, Admiral Farragut, President Garfield, General Greene, Dr. Gross, General Hancock, Professor Henry, President Jackson, Lafayette, President Lincoln (2), General McPherson, General Rawlins, General Scott, General Thomas, Washington.

The stains on the bronze work of all the statues in the parks and the worst stains on their stone pedestals were cleaned off, and broken joints in the stonework of the pedestals repaired with Portland cement where required.

All of these statues are in good condition, but there should be a small annual appropriation of $150 for cleaning them and pointing up the pedestals.

STATUE OF GENERAL SHERMAN.

The site is in the northeast corner of the President's park, south of the Treasury. The site was cleared of the buildings on it, the foundation built, and the main pedestal completed. The terrace, buttresses, and steps belonging to the completed pedestal will be begun at once.

The site was formerly a hole which had been filled with dumpings, consequently a suitable natural foundation was not to be had, as the bottom of the old dumping ground was marshy, like so much of the southern side of Pennsylvania avenue.

Hence the sculptor, who is the contractor with the Government for the entire work, was put to considerable unexpected expense. He was required to drive piles for his foundation, cover them with a grillage, and then build up with sand inside concrete walls to the level where he had hoped to find a suitable natural foundation. The details of this subfoundation are shown on the accompanying drawing.

STATUE OF GENERAL LOGAN.

The pedestal was completed in April, 1898. The time for the completion and placing of the equestrian statue was extended by proper authority to December 4, 1899.

The pedestal proper is of bronze, and in June it was found necessary to fill and calk the joints.

STATUE OF DANIEL WEBSTER.

An item in the sundry civil act for the fiscal year ending June 30, 1899, approved July 1, 1898, provides for the erection of a statue of Daniel Webster, which is to be presented to the city of Washington by a prominent citizen, upon a site to be selected by the Joint Committee on the Library, and appropriates $4,000 for the pedestal for the statue.

On January 24, 1899, this office was notified by the committee that reservation 62, at the intersection of Massachusetts and Rhode Island avenues and N street, between Sixteenth and Seventeenth streets NW., had been selected as the site for the statue.

In March the sculptor commenced the excavation for the foundation of the pedestal. In April and May the pedestal was erected, and on

May 13 the bronze statue (veiled) was placed in position. The date for the unveiling and presentation of the statue has not yet been set.

STATUE OF GEN. ALBERT PIKE.

On January 21, 1899, reservation 188, at the intersection of Indiana avenue, Third, and D streets NW., was, under the authority contained in the joint resolution (Public No. 17) of Congress, approved April 9, 1898, designated as the site for a statue of Gen. Albert Pike, to be presented to the people of the United States by the Masonic fraternity.

During the month of June the sculptor of the statue caused the excavation for the foundation of the pedestal to be made.

MONUMENT AND WHARF AT WAKEFIELD, VA., THE BIRTHPLACE OF WASHINGTON.

No work has been done during the year beyond the usual care extended by the United States watchman in charge.

The wharf was damaged by high tide and wind on Tuesday, October 18, 1898. The timbers were carried off from two spans, Nos. 8 and 9, counting from the inner side of the pierhead. Span No. 7 was left suspended on one broken pile and in danger of being carried away by the next high wind or tide. It was reported that the timbers which were carried away were scattered along the shore for 3 miles in each direction. The timbers are those from under which the iron screw piles, 12 in number, were broken by ice in February, 1897, of which reports with estimates of cost of repairs were submitted by this office to the Chief of Engineers February 20 and 25, 1897. There are no funds available for repairing the wharf, and nothing can be done until an appropriation is provided for the purpose by Congress.

In June, 1899, a gentleman residing at Wakefield was granted a revocable license by the War Department to repair the wharf with a temporary flooring on spruce-pine piles at his own expense and without cost to the United States. At the same time a license for repairing the wharf, which had been granted in April, 1897, to another party, was revoked, he not having availed himself of the privilege granted.

TELEGRAPH AND TELEPHONE CONNECTIONS BETWEEN THE EXECUTIVE MANSION AND EXECUTIVE DEPARTMENTS.

This work, which was commenced in April, 1898, under an allotment of $7,000 made this office April 9, 1898, from the appropriation for "National Defense," act of March 9, 1898, and which was nearly completed by the close of the fiscal year ending June 30, 1898, was entirely finished in July and August, 1898, by placing the telephone instruments in the offices of the Secretary of the Treasury, Attorney-General, Secretary of the Interior, Postmaster-General, and Secretary of Agriculture and connecting them; and by completing the telegraph connections by running two wires to make a metallic circuit of the existing lines.

Money statement.

Amount available July 1, 1898	$3,539.35
Amount expended	999.64
Unexpended balance returned to Treasury	2,539.71

UNITED STATES WHARF PROPERTY, WASHINGTON, D. C.

By the act of Congress approved March 3, 1899, entitled "An act relative to the control of wharf property and certain public spaces in the District of Columbia," the following described property is placed under the immediate jurisdiction and control of the Chief of Engineers of the United States: "The banks of the Potomac River from the north line of the Arsenal grounds to the southern curb line of N street south;" * * *

By letter of March 11, 1899, from the Office of the Chief of Engineers I was directed, as representative of the Chief of Engineers, to assume control of the said wharf line and to prepare and submit to his office, under the provisions of section 2 of the act, such rules and regulations as I may deem necessary for the government and proper care of the property mentioned.

On May 12 a report was submitted by this office to the Chief of Engineers upon that portion of this wharf property which is under its control and which lies between "the north line of the Arsenal grounds and the southern curb line of N street south."

This report was as follows:

Referring to letter from the Department dated March 11, directing me to assume control of a certain part of the wharf line of the Potomac River and to prepare rules and regulations for the government and proper care of the property mentioned, I have the honor to report as follows:

1. A map was obtained showing the present situation of wharves along the line under consideration, and an endeavor made to find out the occupants and claimants.

2. The wharf line was inspected in company with the harbor master, and it was found that one large wharf had been abandoned by its occupiers; several squatters had small wharves, house boats, etc.; a few parties had wharves and buildings and were regularly in possession.

The decision of the Supreme Court published May 1, 1899, in the Potomac flats case established clearly the rights of the United States to the wharf line in question, but intimated that present occupiers might have reasonable claims for reimbursement, which claims would be settled in the supreme court of the District.

The next step was to get a list of occupiers of the wharf line in question and send them each a letter, of which the following is a copy, dated May 12, 1899:

"You are hereby informed that (1) in view of the decision rendered on the 1st instant by the Supreme Court of the United States; (2) in pursuance of authority granted by act of Congress approved March 3, 1899, entitled 'An act relative to the control of wharf property;' (3) in pursuance of letter from the Chief of Engineers dated March 11, 1899, placing this office in charge of the wharf property of the United States reaching from the north line of the Arsenal grounds to the south line of N street, the undersigned has assumed charge of the wharf property above indicated and must take possession thereof for the United States.

"You are therefore requested to remove from such part of said wharf property as may now be occupied by you all property of any description whatsoever which belongs to you and which you may desire to remove.

"A period of sixty days from the 1st day of May is allowed for this purpose, it being the intention of this office to take possession of said property for the use of the United States upon the 1st day of July, 1899."

The next step will be to apply to the legal authorities to eject such occupants as have not moved away by the 1st of July. This is as far, apparently, as I can go until I have obtained actual possession of the wharf line.

The matter of rules and regulations is one which will require careful consideration. It is impossible at present to submit a draft of them, but this will be done at as early a date as possible after I have informed myself of the circumstances and conditions which will affect the occupation of this wharf line by the General Government.

Very respectfully, your obedient servant,

THEO. A. BINGHAM,
Colonel, United States Army, Major, Corps of Engineers.

On May 15 temporary, revocable permission was given the depot quartermaster of this city for a berth for a small steamer belonging to the Quartermaster's Department at the river bank south of the so line of N street SW.

A drawing is submitted herewith showing the United States wh from N street south to the Arsenal as it now is.

For the proper care of this wharf there are needed at once a watchman and a night watchman who will always in future be nee to care for Government property here. It is necessary to prevent sq ters, to preserve such buildings as are now or will in future be th to keep away house boats, loafers, and the idle class who invari haunt a river front.

This wharf is now in a very unsightly and dirty condition, cov with tumbled-down buildings, old useless piles and pieces of wh house boats, squatters, etc. It should be at once cleared off and cle up—old piles and useless and rotten buildings and cabins torn do and be put in a condition for future improvements.

An estimate of $5,000 is submitted for this purpose.

A drawing is also submitted herewith intended as a prelimi study of the adaptation of this wharf to Government uses.

It contemplates, as will be seen, separate docks and slips for use of the various departments of the Government with one wharf elevator for the use of all, where coal can be stored and deliv to United States vessels by chute.

There are two methods of building these wharves:

One by driving piles of iron or steel, hollow or solid, connec them by I-beams and braces and placing a plank flooring over all.

Second, by building walls of stone, either with or without cem and filling in with stone and earth, making each wharf a solid emba ment. This method might also require a pile foundation under wa

The plan submitted contemplates, as will be seen, an easy cheap but very effective adornment of the street end of this wh with turf, flower beds, trees, and fountains.

Estimate.

One day watchman	$
One night watchman	
For cleaning up, clearing away, removing old buildings, piles, etc.	5,0
Wharf of solid steel piles 7 inches in diameter, with steel braces and I-beams and plank flooring, at $3 per square foot, each wharf say $35,000, for seven wharves	245,0
Wharf of stone and earth at $150 per running foot of perimeter, each wharf say $75,000, for seven wharves	525,0

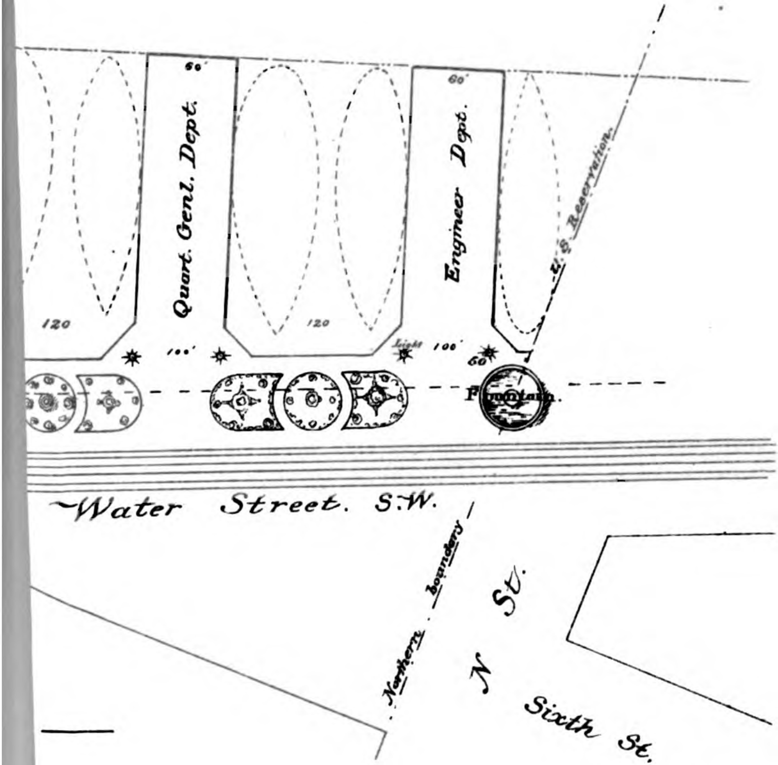
SUMMARY OF WORK DONE DURING THE YEAR.

For convenience of reference a brief summary of the more importan items of work accomplished during the year is given as follows:

Executive Mansion.—The entire exterior repainted. A new polic call service installed. The automatic telephone exchange system, placing the mansion in direct private communication with Cabinet officers, commenced in April, 1898, completed. New drapery curtains placed at the windows of the East Room, and the furniture in the apartment, consisting of 26 pieces, repaired, reupholstered, and recovered. One of the bed chambers repapered and repainted. An entirely new system of underground mains of all kinds—sewer, water, gas, and electric—placed in a concrete tunnel, constructed. An additional greenhouse constructed.

Washington Monument.—Improvements made in the expansion

[illegible] U.S. ARMY.


Quart. Genl. Dept.
Engineer Dept.
U.S. Reservation.
60'
60'
120
120
100'
100'
60
Light
Fountain.
Water Street. S.W.
Northern boundary
N St.
Sixth St.

Eng 56 1

arrangements on the main steam pipe. Permanent telephone connection of the top of the monument with the engine room, boiler house, and elevator made. Iron framework stiffened from base to 350-foot level.

Public grounds.—An additional greenhouse and a pit addition to the propagating house constructed in the nursery grounds, and 720,000 bedding plants propagated for planting out in the public parks. An asphalt pavement, with vitrified block gutters, covering an area of 6,200 square yards, constructed upon the roadway east and south of the State, War and Navy Department building. Asphalt pavements in the parks extended by 1,534 square yards of roadway and 1,243 square yards of footwalk; 4,020 square yards of asphalt roadway and 820 square yards of asphalt footwalk repaired and resurfaced. Eight electric lights installed in the Executive Mansion grounds and 12 in Monument Park. Eighty-six feet of cobble-stone gutters constructed and 1,237 feet of drainpipe laid. Granite blocks, with the letters "U. S." cut in their upper surfaces, placed in the ground at the corners of 18 of the small triangular reservations. One hundred and fifty-two young trees and 759 shrubs planted. Three hundred sections of high iron fence, 2,422 iron posts and chains, and 214 iron posts and bars in fences inclosing reservations, 216 lamp-posts and lamps, and 18 flower vases painted. Twelve hundred and sixty-three feet of additional water pipe laid. Four hundred and fifty-four applications for permits for projections beyond the building line investigated and reported upon. The granite pedestal for the equestrian statue of General Sherman constructed.

THE PRESSING NEEDS OF THIS DEPARTMENT.

For the ensuing year are two, a large brick storehouse and more park watchmen.

The only storehouse now available is a tumble-down "shack," long used for cement during the construction of the State, War, and Navy building. We have struggled along for years with this building, which is now a sieve against rain and sure to fall down under the wind one of these days. Inspection only is needed to show the urgent necessity for a storehouse at the earliest possible date. It should be of brick and about 100 feet by 40. It can be built for $6,500. We have absolutely no place of shelter for records, models, valuable tools, such as road roller, road scrapers, lawn mowers, hose, stakes, shovels, and hoes; nor for waterwork and plumber's supplies, water pipe and fittings, tools, lathe, drills, etc.; nor for gardener's supplies, flowerpots, flower baskets, wire frames, twine, stakes; nor for carpenters' tools, and lathe, etc.

Also, there being no storerooms at the Executive Mansion, such a storehouse as is asked for would almost be paid for by the money now expended to pay for storage of carpets, awnings, furniture, cloak and hat boxes, band stand, chairs, music stands, etc.

The second great need is for more park watchmen. There are now 23 on the force, 18 day and 5 night watchmen, and the area to be guarded is 401 acres.

With the increase of the city population and the growing numbers of excursionists and other travelers, it is impossible to do the work required. Some idea of the travel to Washington is given by the fact that on an average 12,000 people visit the top of the Washington Monument every month. These are ninety-nine one-hundredths strangers. Moreover, our poverty compels us to use the park watchmen partially as laborers to clean up trash, so that it is not possible to get full watchman's duty.

Again a large amount of the damage done in improved parks could be prevented by having additional watchmen.

The one day watchman now allowed for the "White Lot" or President's Park is quite unable to cope with "scorching" bicyclers, fast drivers, and trespassers on the grass and shrubbery, and patrol 63 acres of ground.

At night this large area with thickets of shrubs is absolutely defenseless, as there is no night watchman. After dark no decent woman, or couple of them, dare go through these grounds, and it has on several occasions proved dangerous for men. Robberies and other crimes occur here every now and then, and this within 1,000 yards of the Executive Mansion. It is a reproach that this part of the National Capital should be the haunt of the criminal classes of the city, especially in spring and summer when the parks should be safest.

In summer, owing to the crowds which frequent the bathing beach on the Monument grounds, a day watchman is urgently needed in that park. There is practically now no watchman for this large area of 78 acres in the daytime, because the watchmen at the Monument are kept busy there all the time looking after visitors.

Still more is a night watchman needed here, where there is none now. A good deal of travel passes through this park and its thickets are as dangerous and unprotected as President's Park. Moreover, this park contains the propagating gardens and nursery, where there is a great deal of valuable property, much of it inflammable.

Henry and Seaton parks cover about 34 acres and are more frequented than other parks by a lawless element. In the daytime two watchmen are necessary and are now provided by law, but only one night watchman is now allowed. There is great need of another night watchman here. It is too large and dangerous a patrol for one man at night.

For similar reasons Garfield Park, covering 24 acres, seriously needs a second night watchman.

I can not express too strongly the urgent need of an inspector of park watchmen. There is no one now to patrol the city, see that the park watchmen keep up to their duty, decide questions of duty for them, hear and settle minor complaints, appear in court as witness for trials without leaving the parks unguarded (as now has to be done), report daily to the officer in charge on discipline of the force and the performance of guard duty, etc. The need of such a sergeant of park police is imperative and provision therefor is respectfully urged.

To sum up the matter of park watchmen, I respectfully urge upon the attention of Congress the imperative necessity for the following additional park watchmen for the preservation of public property and public good order and decency, all of which are included in my estimates:

1 sergeant of park watchmen	$900
1 second day watchman President's Park (grounds south of Executive Mansion)	720
1 night watchman President's Park (grounds south of Executive Mansion)	720
1 day watchman Monument Park	720
1 night watchman Monument Park	720
1 second night watchman Henry and Seaton parks	720
1 second night watchman Garfield Park	720
Total	5,220

Estimates for the fiscal year ending June 30, 1901.

Salaries of employees, public buildings and grounds, etc.:		
1 assistant engineer in office of public buildings and grounds[1]	$2,000.00	
1 office clerk	1,800.00	
1 office clerk	1,600.00	
1 messenger	840.00	
1 landscape gardener	2,000.00	
1 surveyor and draftsman	1,500.00	
Overseers, draftsmen, copyists, foremen, gardeners, mechanics, and laborers	35,000.00	
1 sergeant of park watchmen	900.00	
1 day watchman in Lafayette Park	660.00	
1 day watchman in Franklin Park	660.00	
2 day watchmen in Smithsonian grounds, at $660 each	1,320.00	
2 night watchmen in Smithsonian grounds, at $720 each	1,440.00	
1 day watchman in Judiciary Park	660.00	
1 night watchman in Judiciary Park	720.00	
1 day watchman at Lincoln Park and adjacent reservations	660.00	
1 day watchman at Iowa Circle	660.00	
1 day watchman at Thomas Circle and neighboring reservations	660.00	
1 day watchman at Washington Circle and neighboring reservations	660.00	
1 day watchman at Dupont Circle and neighboring reservations	660.00	
1 day watchman at McPherson and Farragut parks	660.00	
1 day watchman at Stanton Park and neighboring reservations	660.00	
2 day watchmen at Henry (Armory) and Seaton parks, at $660 each	1,320.00	
2 night watchmen at Henry (Armory) and Seaton parks, at $720 each	1,440.00	
1 day watchman at Mount Vernon Park and adjacent reservations	660.00	
2 day watchmen at grounds south of Executive Mansion, at $720 each	1,440.00	
1 night watchman at grounds south of Executive Mansion	720.00	
1 watchman for greenhouses and nursery	660.00	
1 day watchman at Monument Park	720.00	
1 night watchman at Monument Park	720.00	
1 day watchman at Garfield Park	660.00	
2 night watchmen at Garfield Park, at $720 each	1,440.00	
1 watchman for the care of the monument and dock at Wakefield, Va., the birthplace of Washington	300.00	
		$65,800.00
Contingent expenses, public buildings and grounds		700.00
Improvement and care of public grounds:		
Improvement and maintenance of grounds north and south of Executive Mansion	5,000.00	
Ordinary care of greenhouses and nursery	2,000.00	
For the construction of an iron and brick storehouse at the nursery	6,500.00	
Ordinary care of Lafayette Park	1,000.00	
Ordinary care of Franklin Park	1,000.00	
Improvement and ordinary care of Lincoln Park	2,000.00	
Care and improvement of Monument grounds	3,000.00	
Continuing improvement of reservation No. 17 and site of old canal northwest of same	3,000.00	

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[1] Appropriated for for fiscal year ending June 30, 1900, in "sundry civil appropriapriation act," approved March 3, 1899.

Improvement and care of public grounds—Continued.		
Construction and repair of post-and-chain fences; repair of high iron fences; constructing stone coping about reservations; painting watchmen's lodges, iron fences, vases, lamps, and lamp-posts; manure and hauling the same and removing snow and ice; purchase and repair of seats and tools; trees, tree and plant stakes, labels, lime, whitewashing, and stock for nursery; flowerpots, twine, baskets, wire, splints, moss, and lycopodium, to be purchased by contract or otherwise, as the Secretary of War may determine; care, construction, and repair of fountains; abating nuisances, cleaning statues, and repairing pedestals	$15,850.00	
For improvement, care, and maintenance of various reservations	20,000.00	
For improvement, maintenance, and care of Smithsonian grounds	2,500.00	
For improvement, care, and maintenance of Judiciary Park	2,500.00	
For laying asphalt walks in various reservations	2,000.00	
For improvement, care, and maintenance of grounds of 7 Executive Departments, at $400 each	2,800.00	
		$69,150.00
Care, repairs, fuel, etc., Executive Mansion:		
For care, repair, and refurnishing Executive Mansion, to be expended by contract or otherwise, as the President may determine	20,000.00	
Fuel for Executive Mansion, greenhouses, and stable	3,000.00	
Care and necessary repair of greenhouses	5,000.00	
Repairs to conservatory	2,000.00	
		30,000.00
Lighting the Executive Mansion and the public grounds:		
Gas, pay of lamplighters, gas fitters, and laborers; purchase, erection, and repair of lamps and lamp-posts; purchase of matches and repairs of all kinds, stoves, fuel and lights for office and office stable, for watchmen's lodges, and for greenhouses at the nursery: *Provided,* That for each 5-foot burner not connected with a meter in the lamps on the public grounds not more than $20 shall be paid per lamp for gas, including lighting, cleaning, and keeping the lamps in repair, under any expenditure provided for in this act, and said lamps shall burn every night on the average from forty-five minutes after sunset to forty-five minutes before sunrise; and authority is hereby given to substitute other illuminating material for the same or less price, and to use so much of the sum hereby appropriated as may be necessary for that purpose	12,500.00	
For lighting 6 arc electric lights in Executive Mansion grounds within the iron fence 365 nights, at not exceeding 25 cents per light per night	547.50	
		13,047.50
Lighting public grounds, District of Columbia:		
For lighting 7 arc electric lights in grounds south of the Executive Mansion 365 nights, at 20 cents per light per night	511.00	
For lighting 32 arc electric lights in Lafayette, Franklin, Judiciary, and Lincoln parks 365 nights, at 25 cents per light per night	2,920.00	
For lighting 14 arc electric lights in grounds south of the Executive Mansion and Monument Park 365 nights, at not exceeding 25 cents per light per night	1,277.50	
		4,708.50
Repairs to water pipes and fire plugs:		
Repairing and extending water pipes, purchase of apparatus for cleaning them, purchase of hose, and for cleaning the springs and repairing and renewing the pipes of the same that supply the Capitol, the Executive Mansion, and the buildings for the State, War, and Navy Departments		2,500.00
Telegraph to connect the Capitol with the departments and the Government Printing Office:		
For care and repair of existing lines		1,500.00
Total		187,406.00

Washington Monument, elevator, electric lights, and machinery connected therewith.

The following estimate for operating the elevator, the electric lights, and the machinery connected therewith for the fiscal year ending June 30, 1901, is submitted:

1 custodian, at $100 per month	$1,200.00
1 steam engineer, at $80 per month	960.00
1 assistant steam engineer, at $60 per month	720.00
1 fireman, at $50 per month	600.00
1 assistant fireman, at $45 per month	540.00
1 conductor of elevator car, at $75 per month	900.00
1 attendant on floor, at $60 per month	720.00
1 attendant on top floor, at $60 per month	720.00
3 night and day watchmen, at $60 per month	2,160.00
For fuel, lights, oil, waste, packing, tools, matches, paints, brushes, brooms, lanterns, rope, nails, screws, lead, electric lights, heating apparatus, oil stoves for elevator car and upper and lower floors, repairs to engines, boilers, dynamos, elevator, and repairs of all kinds connected with the Monument and machinery, and purchase of all necessary articles for keeping the Monument, machinery, elevator, and electric-light plant in good order	3,000.00
Total	11,520.00

As some of the foregoing estimates are larger than the amounts heretofore appropriated, it is deemed advisable to submit the following brief explanation in reference thereto:

First. The sum of $6,500 is asked for an iron and brick storehouse at the nursery. The necessity is pressing and is explained in full in another part of this report.

Second. One sergeant of park watchmen at $900, and six additional park watchmen at $720 each, are asked for, the necessity for which is explained at length in preceding pages of this report under the heading "The pressing needs of this department."

Third. One office clerk (of fourth class) $1,800. The work of the office has increased so largely in recent years that the one clerk allowed is unable to perform it unaided, and help has had to be borrowed, from time to time, from other sources. This is a tax on other branches of the Government and it seems only proper that sufficient clerical force should be provided to properly and expeditiously perform the office work and keep it up to date, which is now impossible. During the fiscal year commencing July 1, 1899, this office will have appropriations to expend amounting in round numbers to $285,000.

Fourth. I have asked for $700 for contingent expenses, in place of the $500 usually granted. The increase of $200 is required, first, to purchase a new typewriter, of which the office is greatly in need. The one now in use was purchased twelve years ago and is now in bad condition; and, second, to pay the increased amount which will be charged for telephone service should the rate fixed by the act of Congress approved June 30, 1898, be declared by the courts to be invalid and inadequate.

Fifth. The sum of $2,800 has been asked for "improvement, care, and maintenance of grounds of seven Executive Departments." The reasons for requesting this sum are given herein, under the head of "Propagating gardens."

Financial statement for fiscal year ending June 30, 1899.

Title of appropriation.	Available at beginning of fiscal year.	Expended during fiscal year.	Pledged by contract.	Unexpended balance to revert to Treasury.
Improvement and care of public grounds, 1899	$54,300.00	$53,374.00		$926.00
Repairs, fuel, etc., Executive Mansion, 1899	40,000.00	38,003.35		1,996.65
Lighting, etc., Executive Mansion, etc., 1899	17,256.00	16,597.30		658.70
Repairs to water pipes and fire plugs, 1899	2,500.00	2,494.98		5.02
Telegraph to connect the Capitol with the departments and Government Printing Office, 1899	1,500.00	1,499.34		.66
Contingent expenses, public buildings and grounds, 1899	500.00	492.00		8.00
Salaries of employees, public buildings and grounds, 1899	49,520.00	49,371.33		148.67
Care and maintenance of the Washington Monument, 1899	11,520.00	11,500.11		19.89
Pedestal for statue of Gen. John A. Logan [a]	16,499.21		$16,500.00	
Equestrian statue of Gen. William T. Sherman [a]	80,000.00	5,135.00	74,000.00	
Purchase and repair of building where Abraham Lincoln died [a]	827.00			
Lincoln tablet, Gettysburg National Park [a]	4,934.60			
Building for Government Printing Office, repairs, and rent [a]	28,403.53			

[a] Not a fiscal year appropriation.

In conclusion, I desire to renew the expression of my sincere appreciation of the faithful and efficient manner in which Mr. George H. Brown, the skillful and accomplished landscape gardener, and Mr. E. F. Concklin, overseer, have performed the various and important duties committed to their charge. Acknowledgment is also due Mr. John I. King, foreman, for the ability and energy displayed in the often difficult and vitally important work which was under his immediate supervision.

I am, General, very respectfully, your obedient servant,

THEO. A. BINGHAM,
Colonel, United States Army, Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

APPENDIX D D D.

NORTHERN AND NORTHWESTERN LAKES—CORRECTING AND ISSUING CHARTS—SURVEYS—WATER LEVELS.

REPORT OF LIEUT. COL. G. J. LYDECKER, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Detroit, Mich., July 29, 1899.

GENERAL: I have the honor to submit herewith my annual report on survey of the Northern and Northwestern Lakes for the fiscal year ending June 30, 1899.

Very respectfully, your obedient servant,

G. J. LYDECKER,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

D D D 1.

NORTHERN AND NORTHWESTERN LAKES—CORRECTING AND ISSUING CHARTS—SURVEYS—WATER LEVELS.

The project of operations under the limited appropriations made for this work in recent years has provided (1) for preparing and issuing charts for the use of navigators; (2) for correcting old charts and projecting new ones, including local surveys or examinations required for such corrections or additions. This project was somewhat extended during the last year to include some measurements of discharge and slope of the lake connecting rivers as an initial step in the investigation of lake levels, the ultimate object of which is to ascertain the best method of regulating these levels and maintaining the depths of improved commercial channels in these waters.

Operations during the year ending June 30, 1899, as related to these several objects were as follows:

Charts.—The following statement shows the number of charts received and disposed of at this office:

Description.	Number.	Total.
On hand July 1, 1898	4,721	
Received during the year	6,094	
Total on hand and received	....	10,815
Sold at 31 cents each	16	
Sold at 30⅔ cents each	18	
Sold at 27 cents each	167	
Sold at 26⅔ cents each	138	
Sold at 25 cents each	21	
Sold at 24 cents each	21	
Sold at 23 cents each	376	
Sold at 20 cents each	3,778	
Sold at 7 cents each	22	
Sold at 6½ cents each	17	
Issued to United States vessels and for official use	363	
Destroyed, worthless, not having corrections to date	150	
Total disposed of	....	5,087
On hand July 1, 1899	....	5,728

The sum of $947.42, received from sale of charts, was turned into the United States Treasury. The total number of charts disposed of to date has been 224,010.

Corrections and additions were made in this office to charts named below, after which they were sent to the office of the Chief of Engineers, where the engraved plates were correspondingly amended, viz:

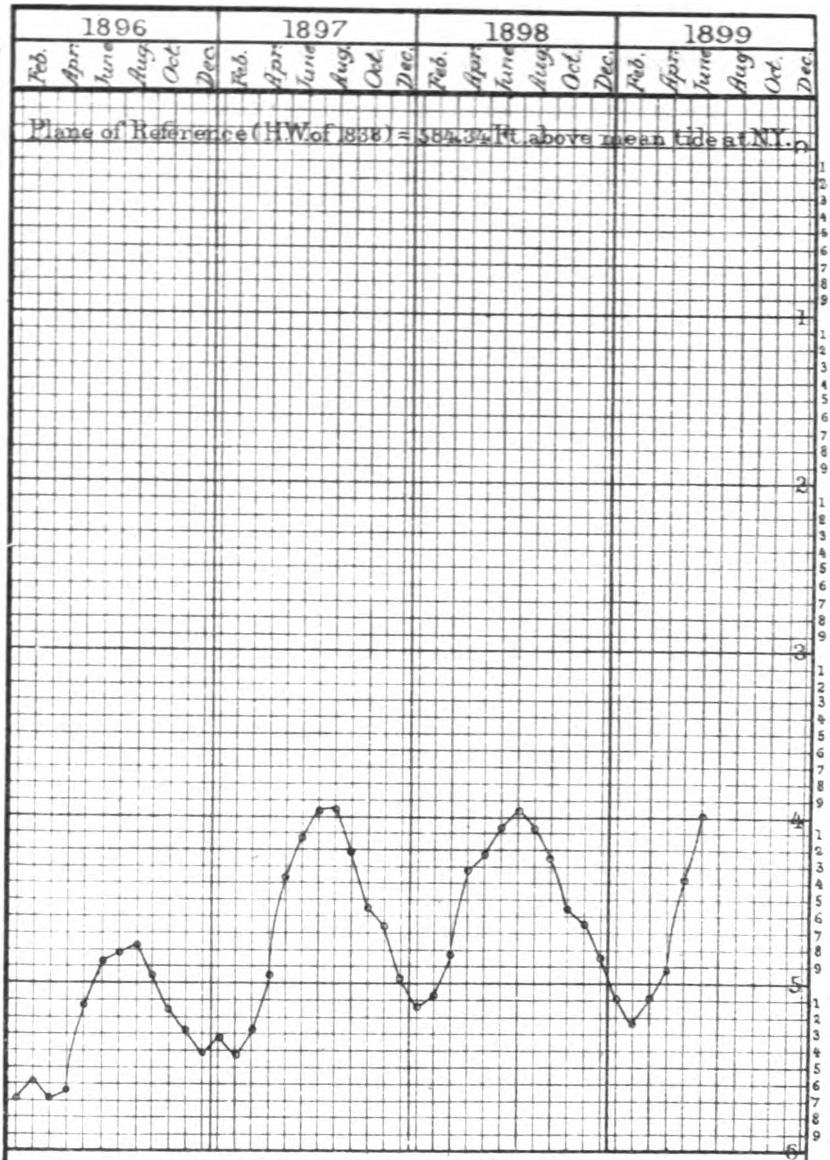
Lake Erie.
Coast Chart No. 6, Lake Erie.
Coast Chart No. 7, Lake Erie.
Sandusky Bay, Lake Erie.
Detroit River.
Lake St. Clair.
St. Clair River.
Lake Huron.
Straits of Mackinac.
North end of Lake Michigan.
South end of Lake Michigan.
Lake Michigan (new).
South end of Green Bay.
St. Marys River, No. 1 (old series).
St. Marys River, No. 3 (new series).
Lake Superior (1895).
Lake Superior (1899).

NOTE.—Lake Superior (1899) revised, corrected, and printed in colors conforming to the new system as adopted for the new chart of Lake Michigan.

In addition to the foregoing, changes were made by hand in this office to a great number of charts lithographed in color. All corrections were predicated on special surveys made under the direction of this office and information from engineer officers in charge of lake-harbor improvements or from other reliable official sources.

New charts.—In addition to correcting old charts, two new ones of the upper and middle sections of the St. Marys River were completed and published during the last fiscal year. These charts are known as (new) Charts Nos. 2 and 3, St. Marys River, and are printed in colors so distributed that the water areas which may be safely navigated, as well as all lights, buoys, and other aids to navigation, are conspicuously indicated. Chart No. 1, of St. Marys River, covering the lower section of the river and adjoining shores of Lake Huron, is nearing its completion.

The new chart of Lake Michigan, projected to scale of 1:400,000 and published to scale of 1:500,000, representing the entire lake on a single sheet, was also completed, photolithographed, and printed in colors.

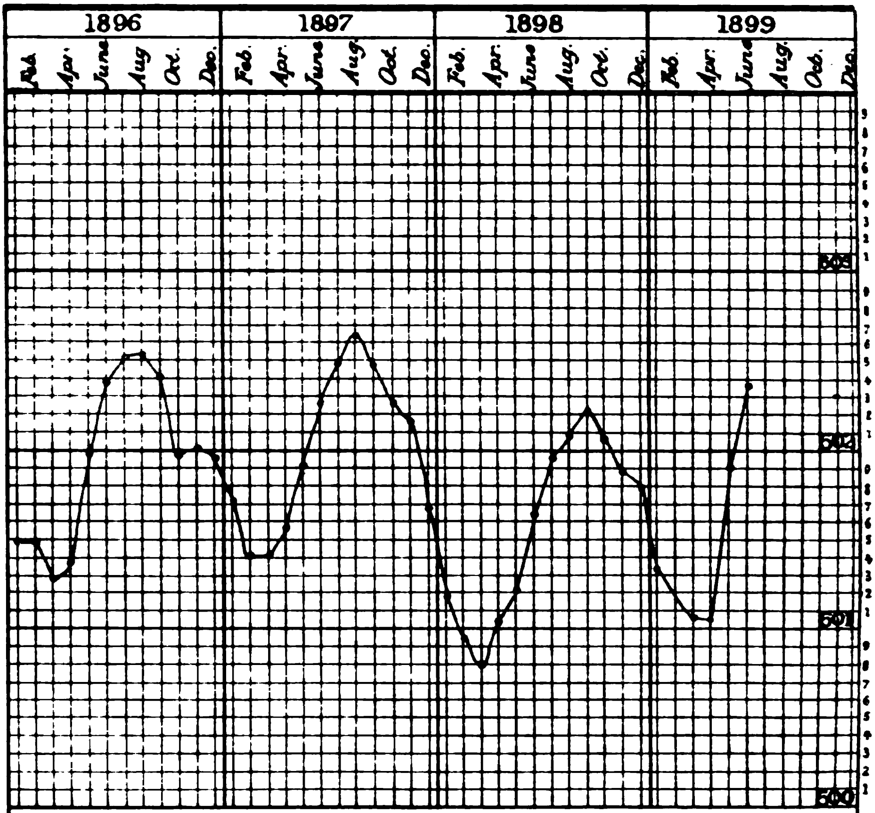


ANNUAL WATER LEVEL CURVE AT
SAND BEACH, LAKE HURON
reduced from monthly means of Noon readings.

Transmitted with my annual report for the fiscal year ending
June 30th 1899.

G J Lydecker
Lieut. Col. Corps of Engrs.

Eng 56 1



ANNUAL WATER LEVEL CURVE, LAKE SUPERIOR
Platted from observations taken "above the Locks" at
St. Marys Falls Canal, Mich.

The water level curve shows the elevation of the surface of the Lake above mean tide at New York. The mean elevation for each month is platted.

Transmitted with my annual Report for the fiscal year ending June 30th 1899.

Lieut. Col. Corps of Engrs.

Upon a general demand for more detailed information for close navigation in the Apostle Island Channels, Lake Superior, the project of constructing three charts of the Apostle Islands and vicinity in colors was approved by the Department, and Chart No. 1, covering all islands (except the south portion of Madeline Island), was commenced on a scale of 1:40,000, to be reduced by photolithography and published to scale of 1:50,000.

Chart No. 2, covering Chaquamegon Bay and adjoining portions of south coast of Lake Superior, will be prepared in the same manner as Chart No. 1. Upon completion of these two charts, they can readily be combined by photolithography into one single coast chart to scale of 1:80,000, for general navigation.

The substitution of colored lithographed charts for the finely engraved ones heretofore used is highly gratifying to vessel masters, as the distinction between navigable and dangerous water areas is plainly apparent at a glance, and the distortion of copper-plate prints by which errors in scaled distances result is entirely obviated. It is, therefore, desirable that this method be extended to the other charts issued from this office. as fast as we find it practicable to do so.

Surveys.—Besides limited surveys made in connection with the correction of old charts a hydrographic survey of Potagannissing Bay, St. Marys River, was in progress and nearly completed at the close of the year. This work was essential for properly completing the resurvey of the St. Marys River and providing data for new chart No. 1, the publication of which has been delayed for this purpose.

Water levels.—The elevation of the water surface of Lake Huron has been recorded, as heretofore, by tridaily readings of the gauge at Sand Beach Harbor of Refuge, and similar record has been kept respecting the upper St. Marys River by gauge at the head of the Government Canal at Sault Ste. Marie, Mich. The following table shows the monthly means for the year as derived from these records:

Monthly means of water level for Sand Beach and Sault Ste. Marie, expressed in feet below the plane of reference adopted in 1876.

Stations.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
Sand Beach	3.96	4.07	4.26	4.57	4.65	4.84	5.10	5.24	5.09	4.92	4.38	3.99
Sault Ste. Marie	2.79	2.67	2.54	2.69	2.86	2.95	3.43	3.58	3.69	3.70	2.84	2.39

The accompanying plats illustrate the varying stages of water as shown by like records for the last four years.

Investigation of lake levels.—A comprehensive project for this most important study was presented in my report of January 15, 1898, and a less extensive one, better adapted to the limited means then likely to be available, was submitted March 28, 1898. These reports are printed in the Report of the Chief of Engineers for 1898, pages 3774 to 3776. The later project was duly approved May 21, and operations during the last fiscal year have been in accordance with it, but limited in extent to conform to the comparatively small amount of money available and the necessity of considerable expenditure therefrom for obtaining the necessary outfit, including a full current meter plant, self-registering water gauges specially designed for the work, precise leveling equipment, steamer, small boats, and other minor items. Field work was planned and carried on with the special object of first doing that part which related especially to the study assigned by Congress to the

Deep Waterways Commission, and the cost of this part of the work was paid jointly by that commission and this office. The principal features of it were measurements of flow and slope of parts of the St. Lawrence, Niagara, St. Clair, and Detroit rivers, including precise leveling operations through a distance of 126 miles on the St. Lawrence, from Cape Vincent at the outlet from Lake Ontario to St. Regis, and over a line 100 miles long from Gibraltar to Fort Gratiot, which provides for an accurate determination of the fall from Lake Huron to Lake Erie at all varying stages of water in these lakes, together with like determination of slope from point to point in the waterway connecting them. Some measurements of discharge were also made in the St. Marys River. Self-registering water gauges were established as fast as they could be supplied by the maker and 8 were in service at the close of the fiscal year, viz, 2 in Niagara River, 1 in Detroit River, 4 between foot of Lake Huron and Lake St. Clair, and 1 at Mackinaw City, Straits of Mackinac. Seven more remain to be placed to complete the series of fifteen as now contemplated. The reduction of data supplied by field operations has been carried forward as time and opportunity afforded, but it has not yet reached such a point as to justify publication at present. One unexpected feature of special interest and importance may be referred to briefly as a result of investigations so far made at the head of the St. Clair River, viz, a marked deepening since the survey of 1867 in that reach of the river which is one of the controlling factors in the outflow of Lake Huron. Steps are now being taken to make a most minute investigation of this locality and thereby obtain data that will be of vital importance in the study of the Lake-Michigan-Huron level.

Details of operations outlined in the foregoing paragraph are contained in the subreport submitted herewith, being that prepared by Assistant Engineer E. E. Haskell, who was charged with their supervision and direction.

It has not been possible with the limited appropriations made during the last ten years to keep our lake survey charts up to the same standard of excellence that they possessed fifteen years ago; they do not correctly show the conditions now existing, and they are by no means so satisfactory to the navigator as they were fifteen years ago. Much more extended surveys and examinations than we have been able to make are necessary for developing natural and artificial changes that are constantly going on, in order that the charts may be brought up to date and kept so. But to do this at a reasonable rate of progress, it is absolutely essential that the annual appropriations of recent years be doubled for a few years to come, and for that reason the appropriation for this purpose should be at least $50,000 for the year ending June 30, 1901. This is certainly a small sum, considering the vast commercial interests dependent upon the accurate, up-to-date condition of these charts. But this work, important as we recognize it to be, must now be extended into a field of still greater importance for the time being, viz, the investigation of lake levels under the project inaugurated during the last year, the immediate practical purpose of which is to devise the best means of regulating these levels, and of preserving or increasing the navigable depth of natural and improved channels in the lakes and their connecting waters. Operations under this project are now dependent upon small allotments from two pertinent appropriations; but, if any reasonable progress is to be realized, it is essential that means be provided for continuing them on a much more extensive scale.

The work is so intimately connected with the lake surveys, past and present, as to induce the suggestion that its further prosecution be in connection with appropriations for these surveys. It will be absolutely impossible to make anything like satisfactory progress in these investigations unless an expenditure of at least $100,000 be provided for during the year ending June 30, 1901.

It is therefore recommended that the estimate for the year 1901 be made to include the two amounts specified in the foregoing paragraph, and that their appropriation be formulated as follows:

For survey of Northern and Northwestern Lakes, including all expenses of correcting, extending, and issuing charts, and investigating lake levels with a view to their regulation, to be available until expended	$150,000

Money statement.

July 1, 1898, balance unexpended	$35,699.21
Amount allotted from act of March 2, 1895	331.64
Amount allotted from act of July 1, 1898	9,739.50
Amount allotted from act of March 3, 1899	18,260.50
	64,030.85
June 30, 1899, amount expended during fiscal year, including $36.90 paid by Treasury Department account Michigan Central Railroad Company.	29,429.86
July 1, 1899, balance unexpended	34,600.99
July 1, 1899, outstanding liabilities	2,541.91
July 1, 1899, balance available	[1]32,059.08

Dates and amounts of appropriations for survey of northern and northwestern lakes.

March 3, 1841	$15,000	March 2, 1868	$77,500
May 18, 1842	20,000	July 20, 1868	75,000
March 1, 1843	30,000	March 3, 1869	100,000
June 17, 1844	20,000	July 15, 1870	100,000
March 3, 1845	20,000	March 3, 1871	175,000
August 8, 1846	25,000	June 10, 1872	175,000
August 12, 1848	25,000	March 3, 1873	175,000
March 3, 1849	10,000	June 23, 1874	175,000
September 28, 1850	25,000	March 3, 1875	150,000
March 3, 1851	25,000	July 31, 1876 (not including $16,000 applied to survey of Mississippi River)	84,000
August 30, 1852	25,000	March 3, 1877 (not including $25,000 applied to survey of Mississippi River and including $9,500 received from sale of steamers)	94,500
March 3, 1853	50,000	June 20, 1878 (not including $49,500 applied to survey of Mississippi River)	49,500
August 5, 1854	50,000	March 3, 1879	85,000
March 3, 1855	50,000	June 16, 1880	40,000
August 30, 1856	50,000	March 3, 1881	18,000
March 3, 1857	50,000	August 7, 1882	12,000
June 12, 1858	75,000	Total	2,939,879
March 3, 1859	75,090		
June 21, 1860	75,000		
March 2, 1861	75,000		
July 5, 1862	105,000		
February 9, 1863	106,879		
July 2, 1864	100,000		
February 28, 1865	125,000		
June 12, 1866	50,000		
March 2, 1867	77,500		

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[1] In addition to this balance reported by Lieutenant-Colonel Lydecker, there remains of this appropriation unexpended the sum of $6,882.21.

PRINTING AND ISSUE OF CHARTS FOR USE OF NAVIGATORS, AND ELECTROTYPING COPPERPLATES FOR CHART PRINTING.

March 3, 1883	$3,000
July 7, 1884	3,000
March 3, 1885	3,000
August 4, 1886	2,000
March 3, 1887	2,000
October 2, 1888	2,000
March 2, 1889	2,000
August 30, 1890	2,000
March 3, 1891	2,000
August 5, 1892	2,000
March 3, 1893	$2,000
August 18, 1894	2,000
March 2, 1895	2,000
June 11, 1896	2,000
June 4, 1897	2,000
July 1, 1898	3,000
March 3, 1899	3,000
Total	39,000

SURVEYS AND ADDITIONS TO AND CORRECTING ENGRAVED PLATES.

March 2, 1889	$5,000
August 30, 1890	10,000
March 3, 1891	10,000
August 5, 1892	5,000
March 3, 1893	25,000
August 18, 1894	25,000
March 2, 1895	25,000
June 11, 1896	$25,000
June 4, 1897	25,000
July 1, 1898	25,000
March 3, 1899	25,000
Total	205,000

REPORT OF MR. E. E. HASKELL, ASSISTANT ENGINEER.

United States Engineer Office,
Detroit, Mich., July 15, 1899.

Colonel: I have the honor to make the following report of progress upon work pertaining to the investigation of lake levels, survey of northern and northwestern lakes, for the fiscal year ended June 30, 1899:

The project for this investigation of lake levels is given in your last annual report, beginning on page 3774 of the Report of the Chief of Engineers for 1898, and attention is invited thereto for a general statement of the work contemplated. Owing to the small appropriation available, plans for undertaking the work were limited to those features of the investigation considered most important, namely, the determination of the laws of flow from one lake to another and the causes and extent of fluctuations of lake levels from year to year.

The determination of the laws of flow from one lake to another required the establishment of a current-meter plant with which the discharge of the various connecting rivers could be measured and their discharge curves determined. A knowledge of the causes and extent of fluctuations of lake levels from year to year required an instrument for accurately recording what these changes are—a self-registering water gauge. The survey up to this time had not been engaged in any work where such an outfit was required, and so had neither a current-meter plant nor any self-registering water gauges on hand. It was, therefore, necessary to provide this outfit, and during the previous fiscal year this work had been anticipated to the extent of considering and preparing plans for the current-meter plant and making working drawings for those parts that were to be constructed. The market offered no self-registering water gauge adapted to the requirements of the lakes, so one had been designed.

The plans for the current-meter plant provided a catamaran for a working boat from which to use the current meters, and this was to be tended by a small tug suitably equipped for the work. A catamaran consists of two steel hulls, entirely inclosed, that are 27 feet long and of 5 feet beam. These hulls are joined by steel trusses carrying a platform or deck that is 16 by 17 feet in size. On this deck is placed an observing house about 10 feet square, which contains a suitable reel for hoisting and lowering the meters through a trapdoor in the deck and tables for recording instruments and keeping notes. The small tug required for tending a catamaran is provided with a steam capstan and the necessary appliances for the rapid and easy handling of anchors.

The contract for the construction of the catamarans, three in number, one each for the Niagara, St. Clair, and St. Marys rivers, was awarded to the Russel Wheel and Foundry Company, of Detroit, the lowest bidders, July 22. The first one of these was completed and delivered November 15, 1898, and the second and third March 8 and May 31, 1899, respectively.

The contract for the construction of the self-registering water gauges, fifteen in number, was awarded to Louis J. Wohnlich, instrument maker, of Detroit, the lowest bidder, July 22, 1898. The first instrument was delivered September 18, 1898, and the last one May 31, 1899.

The survey having no tugs of any kind made purchasing necessary, and the *Fanny H.*, of Port Huron, was purchased October 12 and immediately fitted for service, but owing to the lateness of the season did not go into commission until the opening of navigation this spring. A second tug, the *General G. K. Warren*, was procured by transfer from the engineer office at Milwaukee, and arrived at Detroit May 20, since when she has been thoroughly repaired and fitted for service. The purchase of a third tug has not yet been made.

The current meters required, fifteen in number, were purchased from E. S. Ritchie & Sons, of Brookline, Mass. The order for them was given August 6, and three of them were delivered August 21, three more November 18, 1898, and the remainder May 7, 1899.

WORK ACCOMPLISHED.

Some of the data to be collected in an investigation of lake levels have a bearing on the problem of a deep waterway from the lakes to the sea. The United States Board of Engineers on Deep Waterways, having in charge the investigation of such a water route, has joined with the survey in collecting such information as was desired by both. Under this joint arrangement a line of precise levels was run from St. Regis, on the St. Lawrence River, to Cape Vincent, at the foot of Lake Ontario, a distance of 126 miles. These levels were run by Mr. David Molitor, assistant engineer, and connect a series of nineteen staff water gauges, distributed in the reach mentioned at critical points in the slope, for the purpose of determining the fall of the river. A series of gauge readings, taken at intervals of ten minutes, covering a period of ten days, was made on these gauges in the latter half of July. Permanent bench marks, at least one every 3 miles, were established and carefully described, so as to be of service in the case of future surveys.

A line of precise levels from Gibraltar, at the head of Lake Erie, to Fort Gratiot Lighthouse, at the foot of Lake Huron, was started, and the reaches from Gibraltar to Grosse Point and New Baltimore to Fort Gratiot covered by Mr. O. W. Ferguson, assistant engineer, between September 21 and December 15, 1898, a total distance of 73.5 miles. The reach between Grosse Point and New Baltimore, 27 miles, was run by Mr. David Molitor, assistant engineer, under the direction of this office, during June, thus completing the line. These levels connect a series of fifteen staff water gauges distributed at critical points in the slope along the St. Clair and Detroit rivers. Two series of readings, taken every ten minutes from 7 a. m. to 6 p. m., of six days each, have been taken on these gauges, the first in October, 1898, the second in June, 1899. A large number of permanent bench marks were established along this line for use in making future surveys.

A short series of discharge measurements of the St. Lawrence River at Ogdensburg were made by Mr. C. B. Stewart, assistant engineer, between October 6 and December 3, 1898. This series can be said to give only an approximation to the discharge for the stage of water prevailing at the time. The series should be greatly extended to reach a thorough knowledge of the laws of discharge of this important outlet.

The work accomplished by this office, independently of the board of engineers, may be summarized as the discharge measurements of the Niagara River that have been in progress since September 1, the discharge measurements of the St. Clair River that have been in progress since November 1, with an interruption during the months of January, February, and March on account of interference from ice, and the discharge measurements of the St. Marys River that were prosecuted during the months of January, February, and March only, when work could be carried on upon the ice.

The work upon the Niagara River at Buffalo has been under the immediate charge of Mr. F. C. Shenehon, assistant engineer, and has consisted of making discharge measurements of the river from the International Bridge and collecting gauge readings from a series of gauges so placed as to give the level of Lake Erie and the slope of the river from the lake to a point some distance below the discharge section.

The selection of the International Bridge section for this discharge work was governed by two facts: First, our equipment at the time was inadequate for open-river work, and second, this section had been used by the board of engineers on deep waterways in gaugings of the river made by them in the late fall of 1897 and the midsummer of 1898. This prior work made available a considerable amount of data relating to the section, and suggested more work to extend the range of the discharge curves.

During the ten months that this work has been in progress a large number of discharges, vertical and transverse curves, have been measured and a large number of gauge readings collected. The reduction of these data has been prosecuted to a considerable extent, but not to the point where it is possible to give results for publication.

Mr. Shenehon has had in operation since the middle of January two of the new self-registering water gauges, one at the Buffalo Breakwater Light-House, to give a continuous registration of the level of Lake Erie, and the other at the foot of Austin street, in the river, which, with the one at the lake, furnishes a continuous record of the fall from the lake to the discharge section. These gauges have worked very satisfactorily, indeed, and are furnishing a most interesting record, establishing beyond question the importance of this method of collecting data relative to the stage of water in the lakes.

The work upon the St. Clair River at Port Huron and vicinity has been under the immediate charge of Mr. L. C. Sabin, assistant engineer, and has consisted of discharge measurements of the St. Clair River and the collection of data pertaining thereto. Mr. Sabin had charge of the collection of the two series of gauge readings made on the St. Clair and Detroit rivers.

For the limited time that this party has actually been engaged in field work a large amount of data have been collected and one very important discovery made. This discovery is that the head of the St. Clair, that narrow reach of the river extending from the lake downstream for about three-quarters of a mile—the reach that controls the outflow of Lake Huron—has materially deepened since the survey made in 1867. From the information so far collected the indications are that this deepening started about 1887 and continued with considerable speed until 1892. It may still be going on. The exact status of the matter can be told only when we have made an exhaustive study of past gauge records of the lakes and have a very complete hydrographic survey of the locality to compare with the survey made in 1867. Such a survey is now in progress.

This deepening has unquestionably been a large factor in the lowering of the levels of Lakes Huron and Michigan, and it is significant that the mean level of these lakes has lowered 1.6 feet in the last ten years. During this period the mean lift at St. Marys Falls Canal has increased 1.5 feet, and the mean slope from the canal to Lake Huron has increased 0.1 of a foot.

One result of this discovery is to emphasize the importance of the investigation of lake levels that is now in progress and urge the necessity of more funds for carrying on the work of the lake survey. This work is now accumulating on account of insufficient means with which to do what is actually demanded.

Mr. Sabin has had in operation since February two of our new self-registering water gauges, one near the head of the St. Clair River, and the other about 3 miles below. He established a third gauge last month at Roberts Landing on the St. Clair, and is now establishing a fourth one at the foot of Lake Huron. The record of these so far obtained is very satisfactory, and the gauge located at the head of the river, in addition to recording the stage of water, is collecting some most interesting information of seiches that occur in Lake Huron.

The work upon the St. Marys River has been under the immediate charge of Mr. Thomas Russell, assistant engineer. During the months of January, February, and March, while the river was frozen over, Mr. Russell carried on discharge measurements of the river by working through the ice. In addition to making a large number of measurements at Spry's dock section, where quite an extended series of observations were made during the winter of 1895–96, he made a number of measurements of the flow through the Little Rapids and the West Neebish channels. Mr. Russell has nearly completed the reduction of these observations.

Mr. Russell has also collected and reduced a considerable amount of rainfall data of the Great Lakes Basin, extending information that he had previously collected.

Since May 20 Mr. Russell has been engaged in supplementing previous hydrographic work done in Potogannissing Bay. At the close of the fiscal year he had run about 180 miles of sounding lines.

A new self-registering water gauge was established at Mackinaw City, the Straits of Mackinac, May 12, and has been working very satisfactorily since. The remaining gauges of the series of 15 are being placed as rapidly as possible, and probably all will be in operation by the 1st of the coming September.

Considering the fact that at the beginning of the year the survey had no outfit with which to begin the investigation of lake levels, that it has all had to be constructed, I think it will be admitted that fair progress has been made.

Very respectfully, your obedient servant,

E. E. Haskell, *Assistant Engineer.*

Lieut. Col. G. J. Lydecker,
Corps of Engineers, U. S. A.

D D D 2.

PRESERVATION OF BENCH MARKS ALONG THE ERIE CANAL.

REPORT OF CAPT. GRAHAM D. FITCH, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Oswego, N. Y., July 12, 1899.

GENERAL: I have the honor to transmit herewith annual report on Survey of Northern and Northwestern Lakes, preservation of United States bench marks on Erie Canal, for the fiscal year ending June 30, 1899.

Very respectfully, your obedient servant,

GRAHAM D. FITCH,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

The increase in the height of the lock walls and of the bridge piers in the recent enlargement of the Erie Canal by the State of New York would have obliterated 16 of the bench marks which were placed upon these structures by the United States Lake Survey in running a line of levels from the Hudson River to Lake Ontario in 1875. A description of these bench marks will be found on pages 611-613, Professional Papers, Corps of Engineers, U. S. A., No. 24, Primary Triangulations, United States Lake Survey.

The 16 bench marks were temporarily transferred in November, 1896, and November and December, 1897. Work on the structures on which they were originally placed having been completed, the retransfer of the bench marks was begun in June and will be completed early in July, 1899.

D D D 3.

ANNUAL WATER LEVELS OF THE NORTHERN AND NORTHWESTERN LAKES.

Tridaily observations were made at Charlotte and Oswego, N. Y., on Lake Ontario; at Erie Harbor, Pennsylvania; Ashtabula and Cleveland, Ohio, on Lake Erie, from July 1, 1898, to June 30, 1899, and at Conneaut, Ohio, and Monroe, Mich., on Lake Erie, from July 1, 1898, to November 30, 1898; at Milwaukee, Wis., on Lake Michigan., from July 1, 1898, to June 30, 1899; at Escanaba, Mich., on Green Bay, from July 1, 1898, to November 30, 1898, and from May 1, 1899, to June 30, 1899; at Sand Beach, Mich., on Lake Huron and Sault Ste. Marie, and Marquette, Mich., on Lake Superior, from July 1, 1898, to June 30, 1899.

The accompanying table is a continuation of that published in the Annual Report of the Chief of Engineers for 1898, Part VI, page 3779.

Monthly mean of water levels for the several stations below the planes of reference adopted in 1876.

Stations.	1898.						1899.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Charlotte	3.19	3.64	4.01	4.28	4.33	4.37	4.23	4.33	4.04	3.50	3.10	2.96
Oswego	3.25	3.60	4.01	4.26	4.21	4.20	4.12	4.22	3.97	3.41	3.16	3.03
Erie	2.43	2.55	2.85	3.08	3.15	3.06	3.05	3.42	3.10	2.81	2.57	2.40
Conneaut	2.44	2.60	2.90	3.08	3.10	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
Ashtabula	2.42	2.58	2.92	3.13	3.24	3.27	3.22	3.45	3.10	2.82	2.58	2.48
Cleveland	2.52	2.72	3.10	3.30	3.42	3.59	3.44	3.65	3.28	2.98	2.67	2.55
Monroe	2.46	2.51	2.93	3.20	3.40	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
Milwaukee	3.85	4.05	4.40	4.41	4.82	5.16	5.21	5.13	4.93	4.66	4.22	3.91
Escanaba	4.06	4.20	4.44	4.52	4.78	(*b*)	(*b*)	(*b*)	(*b*)	(*b*)	4.42	4.01
Sand Beach	3.96	4.07	4.26	4.57	4.65	4.84	5.10	5.24	5.09	4.92	4.38	3.99
Marquette	2.73	2.60	2.50	2.56	2.76	2.99	3.36	3.56	3.53	3.56	2.85	2.36
Sault Ste. Marie	2.79	2.67	2.54	2.69	2.86	2.95	3.43	3.58	3.69	3.70	2.84	2.39

[a] No record kept on account of lack of funds. [b] Bay frozen over.

WATER LEVEL FOR LAKE SUPERIOR.

REPORT OF MAJ. CLINTON B. SEARS, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Duluth, Minn., July 1, 1899.

GENERAL: I have the honor to submit the following monthly means of Lake Superior water levels at Marquette, Mich., below plane of reference adopted by the United States Lake Survey in 1876, for the fiscal year ending June 30, 1899.

Very respectfully,
CLINTON B. SEARS,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

Monthly mean of water levels for Lake Superior at Marquette, Mich., below the plane of reference adopted by the United States Lake Survey in 1876, for the fiscal year ending June 30, 1899.

Station.	1898.						1899.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Marquette, Mich	2.73	2.60	2.50	2.56	2.76	2.99	3.36	3.56	3.53	3.56	2.85	2.36

Mean for the year July, 1898–June, 1899, 2.947 feet.

WATER LEVEL OF LAKE MICHIGAN.

REPORT OF CAPT. JAMES G. WARREN, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Milwaukee, Wis., July 14, 1899.

GENERAL: I have the honor to transmit herewith diagram[1] showing water levels of Lake Michigan at Milwaukee, Wis., and Escanaba, Mich., for the fiscal year ending June 30, 1899, and table of monthly means.

* * * * * * *

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[1] Omitted.

The reductions to plane of reference are:

	Feet.
For Milwaukee, Wis	0.61
For Escanaba, Mich	0.90

Very respectfully, your obedient servant,

J. G. WARREN,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

Monthly means of water levels for the stations given, below plane of reference of 1876.

Stations.	1898.						1899.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Milwaukee, Wis	3.85	4.05	4.40	4.41	4.82	5.16	5.21	5.13	4.93	4.66	4.22	3.91
Escanaba, Mich	4.06	4.20	4.44	4.52	4.78	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	4.42	4.01

a Bay frozen over.

WATER LEVEL OF LAKE ERIE.

REPORT OF COL. JARED A. SMITH, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Cleveland, Ohio, July 22, 1899.

GENERAL: I have the honor to forward herewith record of water levels on Lake Erie for the fiscal year ending June 30, 1899.

The records were taken at the light-house, Monroe, Mich., and in the harbors at Cleveland, Ashtabula, Conneaut, Ohio, and Erie, Pa.

Very respectfully, your obedient servant,

JARED A. SMITH,
Colonel, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

WATER-LEVEL OBSERVATIONS FOR LAKE ERIE FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

Monthly mean of water levels for Monroe, Cleveland, Ashtabula, Conneaut, and Erie harbors, expressed in feet, below the plane of reference adopted in 1876, that plane being the surface of high water of 1838, and 2.34 feet above the mean level, 1860 to 1875, inclusive.

Stations.	1898.						1899.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Monroe, Mich	2.46	2.51	2.93	3.20	3.40	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
Cleveland, Ohio	2.52	2.72	3.10	3.30	3.42	3.59	3.44	3.65	3.28	2.98	2.67	2.55
Ashtabula, Ohio	2.42	2.58	2.92	3.13	3.24	3.27	3.22	3.45	3.10	2.82	2.58	2.48
Conneaut, Ohio	2.44	2.60	2.90	3.08	3.10	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
Erie, Pa	2.43	2.55	2.85	3.08	3.15	3.06	3.05	3.42	3.10	2.81	2.57	2.40

a No record kept on account of lack of funds.

WATER LEVEL OF LAKE ONTARIO.

REPORT OF CAPT. GRAHAM D. FITCH, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Oswego, N. Y., July 6, 1899.

GENERAL: I have the honor to transmit herewith, in duplicate, the monthly means of the water levels of Lake Ontario at Charlotte and Oswego, N. Y., reduced to the United States Lake Survey plane of references for Lake Ontario, July 1, 1898, to June 30, 1899, both inclusive.

Very respectfully, your obedient servant,

GRAHAM D. FITCH,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

Monthly mean of water levels of Lake Ontario below the plane of reference in 1876, which is 4.98 feet above the zero of the gauge at Oswego.

Stations.	1898.						1899.					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Charlotte	3.19	3.64	4.01	4.28	4.33	4.37	4.23	4.33	4.04	3.50	3.10	2.96
Oswego	3.25	3.60	4.01	4.26	4.21	4.20	4.12	4.22	3.97	3.41	3.16	3.03

APPENDIX E E E.

IMPROVEMENT OF THE YELLOWSTONE NATIONAL PARK, INCLUDING THE CONSTRUCTION, REPAIR, AND MAINTENANCE OF ROADS AND BRIDGES.

REPORT OF CAPT. H. M. CHITTENDEN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
St. Louis, Mo., July 6, 1899.

GENERAL: I have the honor to submit herewith my annual report for the fiscal year ending June 30, 1899, upon the work of improvement of the Yellowstone National Park. My assignment to charge of this work dates only from the 25th of March last. The work not having been under the charge of the Corps of Engineers for several years past, the operations for that portion of the year prior to the above date will, it is presumed, be duly reported through the proper department. Only $5,000 of the current appropriation (act of March 3, 1899) was made available before July 1, and this has been expended almost entirely in the regular spring repairs upon the road system. The extraordinary lateness of the season—the latest known in the history of the Park—has deferred even these minor operations beyond any previous experience and has carried them into the next fiscal year. There is little, therefore, in the way of actual work to report since I took charge.

The annual repairs, including opening the roads through the snows which lay very heavy on the higher sections of the road system, were actively prosecuted during the month of June. A veritable winter climate prevailed throughout the upper Park during the first half of the month, snowstorms being of almost daily occurrence. The melting of the snows and the frequent storms left the ground in many places thoroughly soaked, at the very time when the heavy supplies for the hotels were being hauled into the Park. It has been with much difficulty, therefore, that the roads, which as yet are composed for the most part only of the soil through which they pass, have been placed in fairly passable condition in time for the opening of the tourist season. The accompanying photographs will convey some idea of the difficulties encountered in this work. The ordinary method of doing this preliminary work, based upon many years' experience, is to send out parties at as early a day as practicable to shovel a passage through the deepest snows and then to follow up this work, as soon as the snow is mainly gone, with one or two considerable parties equipped for regular road work. These parties open and repair damaged culverts; repair the bridges, clear away landslides and fallen timber, smooth up the road surface with grading machines, repair retaining walls, and do whatever else is rendered necessary by the action of the elements during the long and severe winters which prevail in this region. As a general thing, fair weather follows closely upon this preliminary work and is the most important factor in putting the roads in good order. Under such circumstances, two or three weeks' work suffices to place the system in as good condition as it is susceptible of.

In other years, when the seasons are late and the snow melting and resultant storms continue after the spring traffic has opened, the problem is far more serious. The experiment has been tried this year on a small scale of posting section gangs at intervals throughout the Park, similar to those on railroads. Only moderate results are looked for, however, in this direction. The road system is not yet in a state of efficiency to make it a complete success. With macadamized pikes the system of small repairs by section crews would undoubtedly be the best, but now the repairs so often amount to actual reconstruction that small parties are incompetent to handle them. The section plan is being tried upon the urgent recommendation of several parties who understand the needs of the Park thoroughly from long residence here, and doubtless considerable benefit will result from the trial.

In addition to the current repair work, plans have been matured for the new work of the season which will be begun promptly upon the opening of the new fiscal year. This work will consist mainly in the building of a new road of about 3 miles length between Mammoth Hot Springs, Wyo., and Golden Gate. This line has been selected after several personal examinations by the officer in charge, and is now being laid out by instrumental surveys preparatory to commencement of the work.

In making up the estimates for the ensuing year in accordance with the customs and regulations of the Engineer Department, to which this work is now returned after the experiment of withdrawal during a period of four and one-half years, it will contribute to a better understanding of the magnitude and importance of the work if a brief sketch of its origin and development is given.

The discoverers of this region in 1870 found numerous trails of infrequent use, made by the Indians, passing over several of the routes now followed by the regular highways. As travelers became attracted here in the early seventies, saddle trails developed leading to the principal localities of interest. The main trail led from the Mammoth Hot Springs, via Mount Washburn, to the falls of the Yellowstone, crossing thence by the now abandoned Mary Mountain route to the Firehole Geyser Basins, where it was joined by another trail coming in from the valley of the Madison on the west. During the superintendency of Colonel Norris, 1878–1882, several wagon trails (mere passage ways for wagons, with no grading except where absolutely necessary) were built, and the present general line was opened from the Mammoth Hot Springs to the Upper Geyser Basin, with a line across Mary Mountain to the lake and canyon. In 1883 the roadwork was formally assigned to Lieut. D. C. Kingman, Corps of Engineers, by whom the project for the Park road system, as it has since been worked out, was prepared. Lieutenant Kingman himself made an important commencement to this work.

The project for a system of tourist routes to the various points of interest in the Yellowstone National Park, as proposed by Lieutenant Kingman, and slightly modified since, embraces a belt line which makes a general circuit of the Park, approaches by which the belt line is reached from various points on the Park boundary, and side roads to scattering points of interest. To these might also be added the numerous trails used mainly by scouts and troops in protecting the Park, but involving little if any outlay for construction or maintenance.

The Belt Line, as proposed, includes Mammoth Hot Springs, Norris Geyser Basin, the Firehole Geyser Basins, the Yellowstone Lake, the Grand Canyon, and the section near Tower Falls below the Grand Canyon at the northern base of Mount Washburn. Between Norris and the Grand Canyon there is a crossroad which will always be of use for freight, even when the Belt Line is complete and tourist travel no longer passes over it.

The main approaches will probably not exceed one on each side of the Park. Of these the principal one now is on the north via the Gardiner River to Mammoth Hot Springs; this is the Northern Pacific connection.

The next most important approach is from the west via the Madison Valley. The Utah Northern connection is here, although the railroad is a day's journey from the boundary of the Park.

The southern approach leads up the valley of the Snake River from the celebrated locality known as Jackson Hole, and joins the Belt Line at the Yellowstone Lake. With a southern railroad connection, this will be an important approach.

On the east there is no regular approach. There is a road to the northeast corner of the Park from near Tower Falls, but it is used almost exclusively by miners located just outside the boundary. It is probable that before many years it may be necessary to make an approach from Big Horn Basin via Jones's Pass to the outlet of the Yellowstone Lake. The necessity for such a road, however, will be contingent upon the advent of a railroad in the Basin, and it is, therefore, not included in the present estimate.

SIDE ROADS.

There are several of these, and there will be many more. Some are passable by wagons, others only by saddle horses. The principal ones are as follows: Around the formation of Mammoth Hot Springs; to Bunsen Peak and the Middle Gardiner Falls; to the various objects of interest in the Firehole Geyser Basins; to the Lone Star Geyser; to the Natural Bridge, near the Yellowstone Lake; to Sulphur Mountain, and along the brink of the Grand Canyon of the Yellowstone below the Falls.

The total mileage of the projected system is about 300 miles.

Of the foregoing project the following portions are now completed in the form of an ordinary graded dirt road 18 feet wide:

The Belt Line is complete, with the exception of the portion from the Grand Canyon, via Tower Falls, to within 3½ miles of Mammoth Hot Springs. The four approaches are all passable by wagons, but only portions of all except the northern approach are completed. Not more than one-third of the work is done on the other three which is required to place them in as good condition as the other roads in the Park. Several of the side roads are open, but they are nearly all of the simplest form of construction that will make a passable driveway.

The work still remaining to be done to complete the project is as follows:

Belt Line.—A new road of about 3 miles in length, to cut out the very severe grades between Mammoth Hot Springs and the Golden Gate; about a half mile of new road in Gibbon Canyon, to cut out some heavy grades there; the raising of about 3 miles of the present road in that vicinity, to protect it from floods in the Gibbon River; the construction, or rather completion, of about 4 miles of road near the Fountain Hotel; the construction of about 8 miles of road from Bluff Point, on the Yellowstone Lake, to Bridge Bay, and the construction of a new road from the Grand Canyon, via Tower Falls, to the East Gardiner Falls.

On the northern approach about 1½ miles of new road is required to diminish existing grades and eliminate a stretch that is dangerous from overhanging cliffs of loose rock. On the western approach about 4 miles of road remain to be constructed. The southern approach has been grubbed and cleared, but remains to be graded—in all, about 20 miles of work. On the eastern approach there remain about 15 miles of new work to be done, including two large bridges.

Of the side roads the most important still unfinished is a road for 2 or 3 miles down the Grand Canyon on the right bank. This will involve the construction of a costly bridge over the Yellowstone.

The bridges throughout the Park have hitherto all been constructed of wood. Although they have answered their purpose admirably, many need to be replaced, and this should now be done with the most approved steel structures with masonry abutments.

The project as above outlined does not include macadamizing the roads. It has been assumed that this would be done along with the annual work of maintenance and repairs. This improvement is, however, an absolutely essential feature of the road system, for the soil is such that it is impossible to maintain the roads in good condition in either the wet or dry portions of the year.

Of the new plant, which is essential to the care and maintenance of the road system, a rock-crushing outfit, concrete-mixing plant, and complete derrick outfit are immediately needed.

Although the work on the road system involves nearly 90 per cent of the annual expenditure of public money in the Park, the pressure for new work has always been so great that it has never been possible to provide a suitable office. That now used is a miserable excuse for an office building, having been knocked together at odd times from the crudest and cheapest materials. A good office, messhouse, and a warehouse are necessary to the proper execution of the work.

Below is an estimate of the amount required for the completion of the existing project after the work of the present season is done:

New road in Gardiner Canyon, including 3 steel bridges	$10,000.00
Road through Golden Gate Canyon, including a new steel bridge, to replace wooden bridge around cliff, and widening road along cliff, the latter all solid rock	15,000.00
Raising 3 miles of road in Gibbon Canyon, and cutting out 1 mile of dangerous grades; also opening 4 miles of new road down the Gibbon to connect with western approach	16,000.00
Completion of 8 miles of road near Fountain Hotel	8,000.00
Completion of southern approach along Snake River, 20 miles	20,000.00
New road from West Thumb to Natural Bridge, cutting out present line around Lake Shore, 8 miles	16.000.00
Surfacing new road from Lake Hotel to Grand Canyon, 15 miles	15,000.00
New bridge across the Yellowstone, near the Falls	20,000.00
New road down right bank of Grand Canyon, 3 miles	6,000.00
New road near Grand Canyon to cut out dangerous hills	5,000.00
New road, Canyon to Norris, 10 miles	20,000.00
New road, Grand Canyon, via Tower Falls, to Mammoth Hot Springs, 36 miles	72,000.00
New bridge over Yellowstone near Tower Falls	10,000.00
New bridge over Lamar River	5,000.00
Completion of east approach, 15 miles	15.000.00
New plant	5,000.00
New office and other buildings	5,000.00

Current repairs and maintenance for season of 1900	$10,000.00
New bridges at various points, 6 needed at once	12,000.00
Office, transportation, and miscellaneous expenses	10,000.00
There should also be added for clearing out and rendering more easily passable the numerous trails throughout the Park, which are essential to its proper police and protection	5,000.00
Total for completion of project in a single season	300,000.00

The superintendent has submitted to me the following estimate of improvements which have become necessary to facilitate his work in protecting the Park:

Two new station houses for troops at detached points in Park	$1,912.50
Four and one-half miles of fence along north boundary, to keep game in and cattle out, in the vicinity of the village of Gardiner, Mont	3,250.00
Station house and entrance gate at northern entrance to Park, where tourists mostly arrive	1,200.00
Surveying, monumenting, and otherwise marking boundaries, 59 miles at $75	4.425.00
	10,787.50
Total appropriation recommended for next fiscal year	310,787.50

There is thus needed to complete the necessary improvement of the Park, if done in a single season, not less than $310,000. After that the annual cost of the Park road system will be that of maintenance only. This, at first, may amount to $100 per mile per year—a very small cost—and even this will diminish with time as the roads become thoroughly macadamized.

In recommending that this sum be appropriated at once, either directly or by authorized contracts, the good of the work itself has not alone been consulted, but economy of cost to the Government as well. It is certain that to complete the project under the present system of small appropriations will cost the Government twice the above sum. As it now is, only small pieces of new work can be taken up in any one year. It has several times happened that practically the whole appropriation has gone into annual repairs. Such work as it is found possible to undertake has nearly always been left in a partially completed state, in which it is so much damaged by the severe winters that a good part of it has to be done over again. Only once in the history of the work has it been possible to make any really rapid progress toward its completion; that was in the season of 1891, when two appropriations, aggregating $150,000, were available. Nearly 60 miles of road were constructed at that time. It is not possible to get a start with the present system of small appropriations, and the officer in charge is every year confronted with the dilemma of having to abandon all new work and spend the money in necessary repairs, or let the roads go to pieces if he undertakes any new work. Every consideration of economy to the Government and advantage to the work will be promoted by providing at once the sum necessary to complete this project. If this can not be done by a direct appropriation, then the next best plan would be to authorize contracts to the amount of the balance not directly appropriated. If the latter method were adopted, 10 per cent ought to be added to the above estimate.

In regard to the purposes for which this money is being expended, it may safely be said that no public work is better justified by the results so far realized. The Park itself is fulfilling the purpose of its creation beyond the expectation of its most sanguine advocates. As a refuge of the native fauna of the continent it is an unqualified success. As a

resort for pleasure seekers and those interested in natural cur
it has continually grown in public favor. Its administration,
tion, and methods of caring for tourists have developed into a com
sive and admirable system. Congress may therefore rest assur
an appropriation for the completion of the approved project of i
ment of the Yellowstone National Park will be in every sense a ju
expenditure.

It is not possible in this report to present a precise statement
cost of the existing project since its adoption in 1883, for in the
years, as well as in the four just past, the appropriations have
part to other purposes. At the close of the present season's work
plete statement of these expenditures will be worked up from the r
The amount, however, will vary but little from $650,000, whic
the $300,000 herein asked for and the $40,000 to be expended dur
present season, will make the cost of the completed project fall
$1,000,000. A very considerable part of this sum, however, ha
used in repairs, maintenance, and reconstruction, and the actu
cost of the project will probably not exceed $750,000.

Money statement.

March 25, 1899, when work was turned over to Engineer Department, balance unexpended	$1,
Allotted from appropriation, sundry civil act of March 3, 1899 ($5,000 immediately available)	35,
	37,
June 30, 1899, amount expended under Engineer Department during fiscal year	1,
July 1, 1899, balance unexpended	35,
July 1, 1899, outstanding liabilities	4,
July 1, 1899, balance available	30,
Amount required for completion of existing project	310,
Amount that can be profitably expended in fiscal year ending June 30, 1901	310,
Total amount expended on existing project to June 30, 1899, is (approximately)	650,

Very respectfully, your obedient servant,

H. M. Chittenden,
Captain of Engineer

Brig. Gen. John M. Wilson,
Chief of Engineers, U. S. A.

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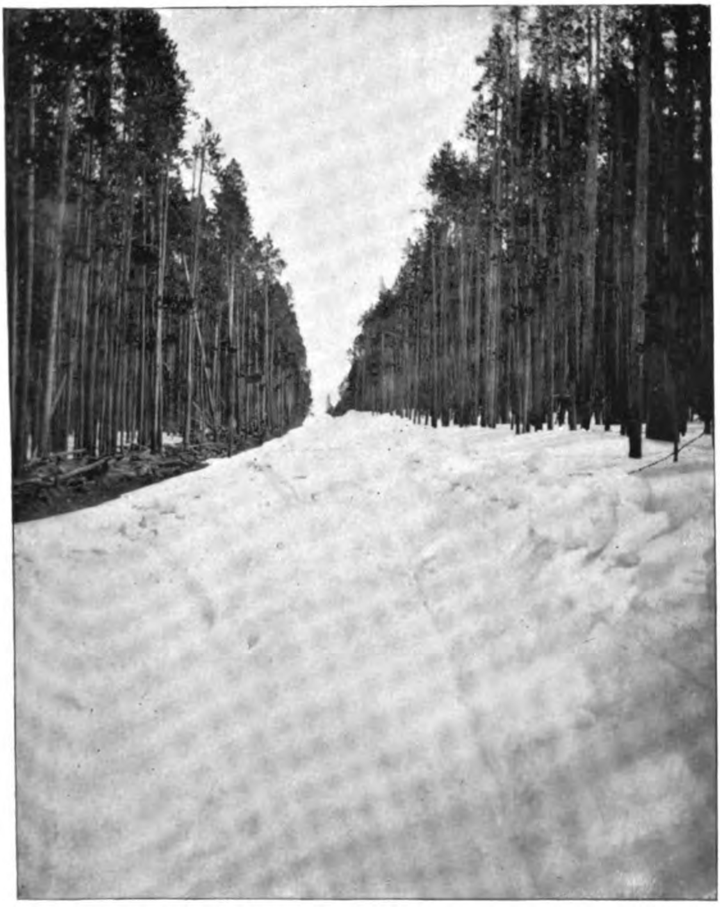
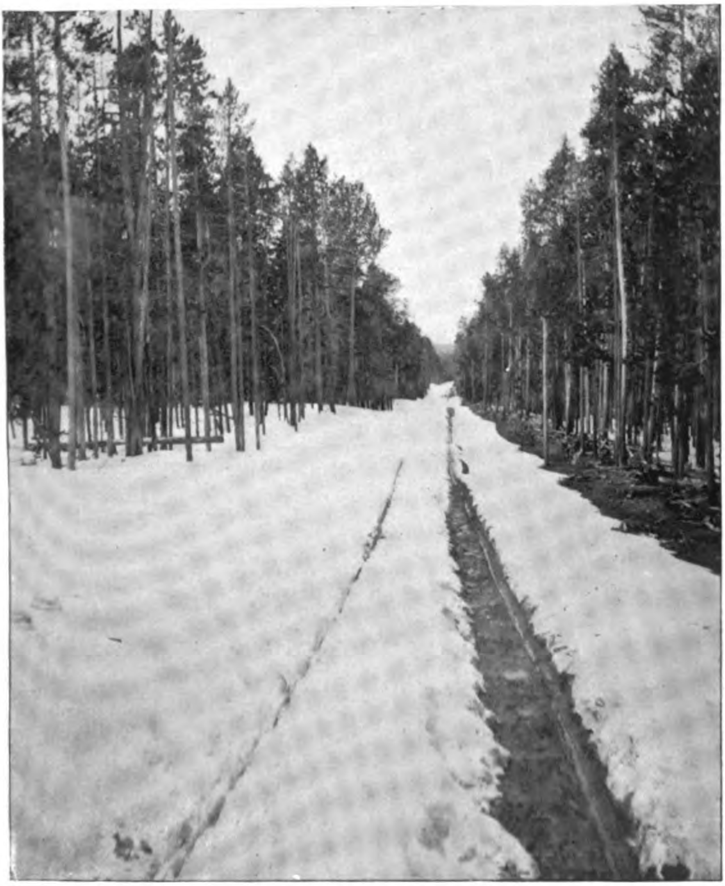
*List of civilian engineers employed on work of improvement in Yellowstone National P
Wyoming, from July 1, 1898, to June 30, 1899, inclusive, under sundry civil act
July 1, 1898, and March 3, 1899, for 1899 and 1900.*

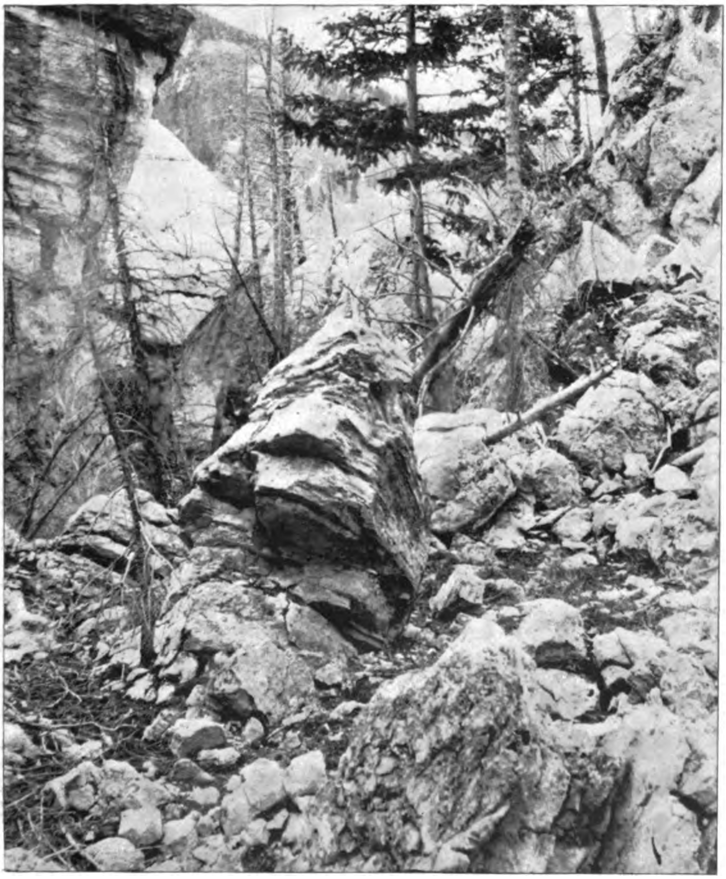
Name and residence.	Time employed.		Compensation per month.	Where employed.
	Mos.	*Days.*		
C. Sherman, Columbus, Ohio	......	20	$150	Yellowstone National Park.
A. E. Burns, Mammoth Hot Springs, Wyo.	2	......	125	Do.



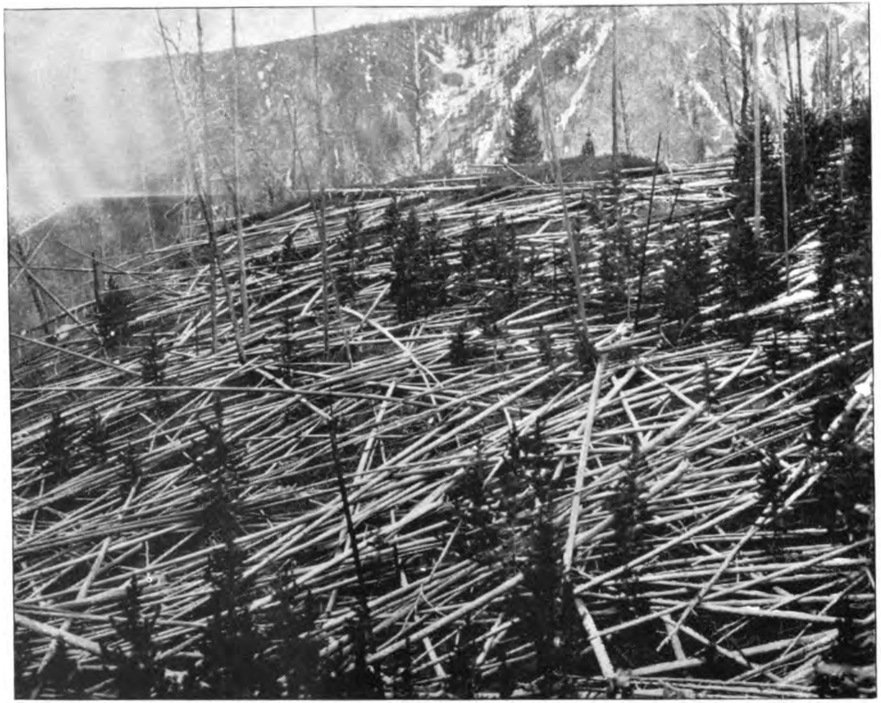
ROAD BETWEEN NORRIS AND THE GRAND CAÑON. LOOKING EAST.
DATE, JUNE 13, 1899.



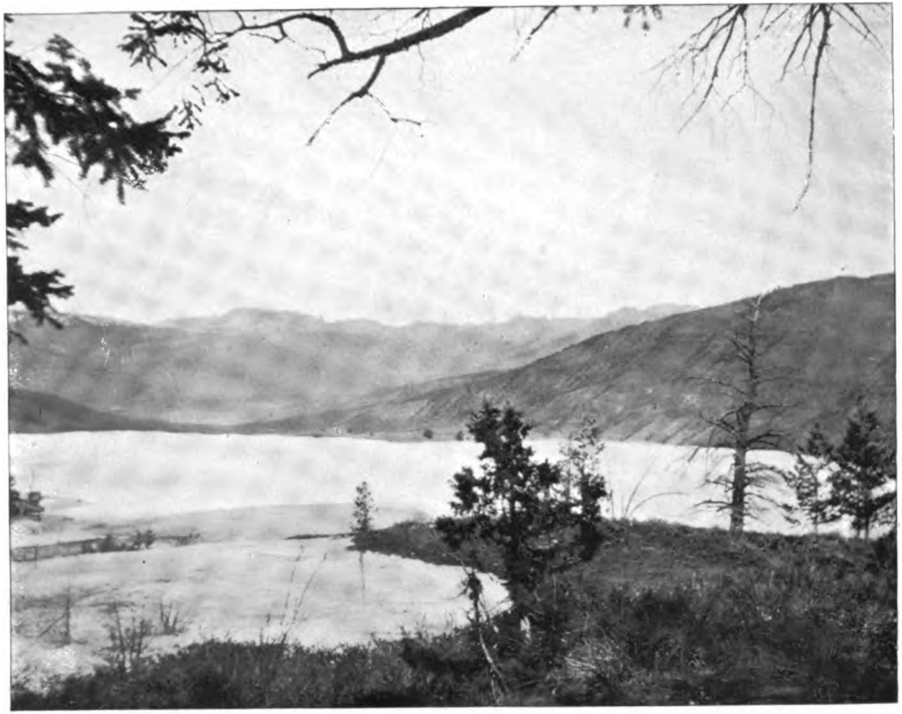
ROAD FROM NORRIS TO GRAND CAÑON. LOOKING WEST.
DATE, JUNE 13, 1899.



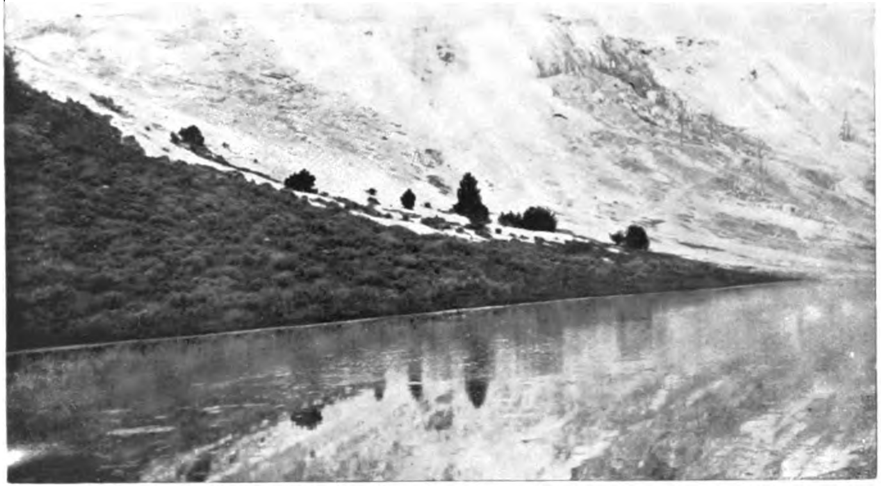
"HOODOO" COUNTRY, ON LINE OF NEW ROAD FROM MAMMOTH HOT SPRINGS TO GOLDEN GATE.



FALLEN TIMBER. ON LINE OF NEW ROAD FROM MAMMOTH HOT SPRINGS TO GOLDEN GATE.

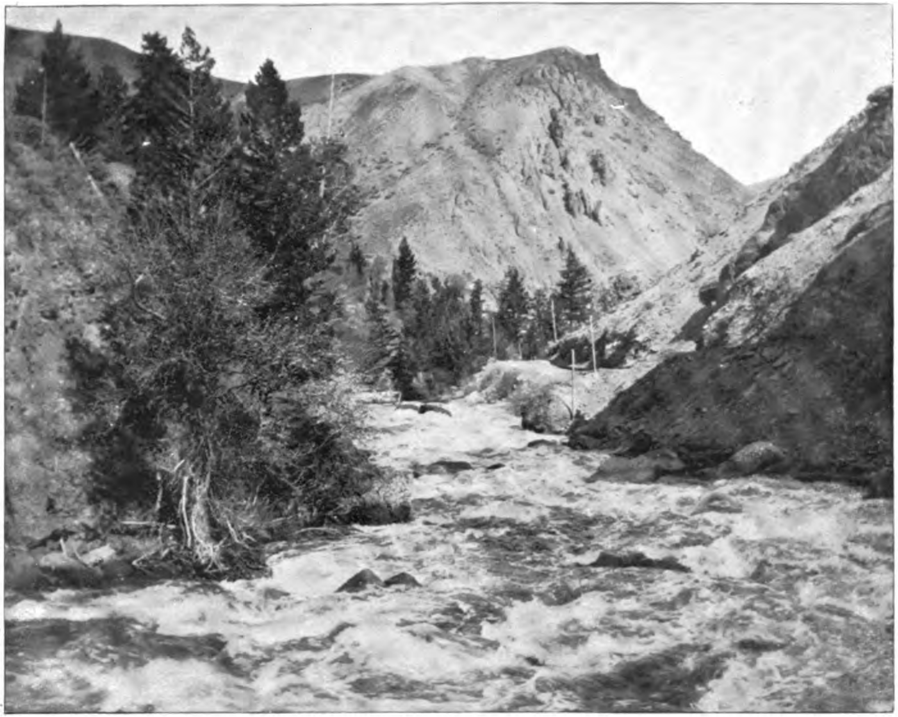


TOP OF MAMMOTH HOT SPRINGS FORMATION. ON LINE OF NEW ROAD UP THE GOLDEN GATE HILL.



FOOT OF MAMMOTH HOT SPRINGS FORMATION. LINE OF NEW ROAD UP GOLDEN GATE HILL.

YELLOWSTONE NATIONAL PARK. No. 7.



THE GARDINER RIVER CAÑON, ROAD TO BE CHANGED TO LEFT BANK ON ACCOUNT OF DANGEROUS SLIDES ON RIGHT BANK.

Abstract of proposals to furnish teams and saddle and pack animals, opened at Mammoth Hot Springs, Wyo., June 15, 1899, by Capt. H. M. Chittenden, Corps of Engineers.

	Number, more or less.	No. 1. J. M. Lloyd.	No. 2. T. F. Callaghan, Mammoth Hot Springs, Wyo.	No. 3. C. B. Scott, Gardiner.
		Per day.	*Per day.*	*Per day.*
Four-horse teams, with driver	5	$5.30	$5.60	$5.00
Four-horse teams, without driver	5	3.80	No bid.	3.50
Single teams, with driver	30	3.40	3.60	3.25
Single teams, without driver	30	1.90	No bid.	1.75
Saddle horses	5	.42	1.00	.45
Pack animals	12	.42	1.00	.45

The amount available under this contract is $35,500.

APPENDIX FFF.

EXPLORATIONS AND SURVEYS IN MILITARY DEPARTMENTS.

FFF 1.

RECONNAISSANCES AND EXPLORATIONS IN THE DEPARTMENT OF THE PACIFIC.

ANNUAL REPORT OF LIEUT. COL. CHARLES L. POTTER, CHIEF ENGINEER, UNITED STATES VOLUNTEERS, CAPTAIN, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

OFFICE CHIEF ENGINEER,
DEPARTMENT OF THE PACIFIC AND EIGHTH ARMY CORPS,
Manila, P. I., June 30, 1899.

GENERAL: I have the honor to forward herewith such reports as have been made by me as Chief Engineer to the Department Commander, and such reports as have been made to me by different officers commanding Company A and different detachments, as follows:

1. Report[1] of the operations of Company A, Battalion of Engineers, February 5, 1899, by Lieut. W. G. Haan, Third U. S. Artillery (with map).
2. Report of operations of Company A, Battalion of Engineers, from September 7, 1898, to March 5, 1899, by Lieut. W. G. Haan, commanding company during this time (with map)[1].
3. Report[1] of operations of detachment under Capt. F. R. Shunk, Corps of Engineers, U. S. A., from March 22 to April 3, 1899 (with my indorsement thereon).
4. Report of operations of detachment under Lieut. W. P. Wooten, Corps of Engineers, U. S. A., from March 23 to April 30, 1899.
5. Report[1] of operations for May, 1899, by Lieutenant Wooten (with my remarks thereon).
6. Report[1] of operations for June, 1899, by Lieutenant Wooten.
7. Report of operations of Company A, Battalion of Engineers, from March 11 to June 30, 1899, by Captain Shunk.
8. Copy of my report of operations and supply of line for month of February, 1899.
9. Copy of my report of operations since joining the expedition.

In carrying on the work of this department, I have been very ably and cheerfully assisted by the officers on duty with the company. I can not speak too highly of the work done by Lieutenant Wooten, who, although a young officer with limited experience, has taken hold of all problems with great ability, zeal, and ingenuity.

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[1] Not printed.

Lieut. Horton W. Stickle is an energetic and cheerful worker, and his short service with the company has shown me that he will undoubtedly make a fine officer.

Lieut. William G. Haan, Third U. S. Artillery (now captain and assistant quartermaster, U. S. V.), did such excellent work in command of the company that I feel that justice requires that I give him special mention. During the time of his command I was so located that I saw a great deal of the men, and their discipline and cheerfulness under all conditions surpassed anything I have ever seen in a command, while his judgment, untiring energy, and interest in his work showed him to be a very superior officer in every respect.

Very respectfully, your obedient servant,

Chas. L. Potter,
Lieut. Col., U. S. Vols., Chief Engineer.

Brig. Gen. John M. Wilson,
Chief of Engineers, U. S. A.

REPORT OF LIEUTENANT-COLONEL POTTER OF OPERATIONS DURING FEBRUARY, 1899.

Office Chief Engineer,
Manila, P. I., March 31, 1899.

Sir: In response to circular from Headquarters Department of the Pacific and Eighth Army Corps, I have the honor to submit the following report of operations of my department during the month of February, 1899:

On the morning of February 5, I sent word to the division commanders that all calls for engineer tools and material would be promptly filled, requesting that the First Division call on the engineer company, and the Second Division call through me on the warehouse at Binonda.

Prior to this I had sent a stock of tools and material from the main warehouse together with two wagons for light and quick work, to be kept with the company. In addition three bull carts were kept at each place for use as needed, and orders were given to the warehouse to call on the transportation quartermaster for extra carts if needed, and to the company to seize any such to be found in case of emergency. For light, quick work from the warehouse I called on Captain Kimball from time to time for light carts.

At the warehouse two men were kept night and day with directions to fill any order that should come direct to them from any commissioned officer. All orders for engineer material were filled promptly upon receipt of telegrams or other order.

In addition to furnishing this material reconnaissances were made immediately after the first two days' fighting, and a map made showing the new lines and location of troops.

The company was employed under Capt. William G. Haan, assistant quartermaster, U. S. Volunteers, who did excellent work in repairs and construction of bridges and roads, cleared the ground in front of General Ovenshine's brigade, and attended to other engineering work, besides taking part as infantry in the operation of February 5, and making a reconnaissance on February 15.

The following is reported from Captain Haan's report to me of the operations of the company under his command:

> The entire army was amply supplied with engineering and intrenching tools, so that wherever the line stopped it could be immediately intrenched. These tools

were supplied from the depot of the chief engineer, where, under the direction of the Chief Engineer, Eighth Army Corps, men of the company with sufficient transportation were in readiness to instantly supply all demands. The possession of two spring wagons and good ponies in this depot greatly facilitated the quick delivery of the lighter articles, while the heavier articles, such as bales of sand bags, shovels, and picks, had to be hauled in bull carts.

On February 15, I took the company out for a reconnaissance in force and became attached to part of the First Brigade, First Division, making a demonstration against Pateros, near Laguna de Bay. The company here developed a considerable force of Insurgents, and was under fire for about an hour and a half, our supports having withdrawn without our knowledge.

The men behaved magnificently under fire and a terrible heat, five of them being partially overcome by the hot sun. The distance passed over this day was 27 miles of rather difficult ground and on a very hot day. The nature of the country was learned, and the object of the reconnaissance fully accomplished.

In this connection I wish specially to mention Private John Varney, jr., who volunteered to go out in the open field to recover a haversack belonging to another man of the company, and which had been dropped. He was fired upon by about ten Insurgents from a distance of about 200 yards, and showed the greatest coolness and courage while under the heavy fire.

Since hostilities began the company has repaired all roads and bridges, built new bridges where necessary; also a new road to center of First Division line, keeping the line supplied with all necessary engineer supplies, maps, etc.

The conduct of the company while under my command has been most excellent, and their information and intelligence of such a high order that discipline is maintained and all work performed, not from fear of punishment for neglects, nor from hope of reward, but from a high sense of duty well performed, such as one would expect rather from officers than enlisted men.

The part taken by the engineer company on February 5 has already been reported by Captain Haan through me.

Very respectfully,

Chas. L. Potter,
Lieut. Col., U. S. Volunteers, Chief Engineer.

The Adjutant-General,
Department of the Pacific and Eighth Army Corps.

REPORT OF LIEUTENANT-COLONEL POTTER OF OPERATIONS FROM MAY, 1898, TO JUNE 30, 1899.

Office Chief Engineer,
Manila, P. I., June 30, 1899.

Sir: I have the honor to submit the following report of work done by the Engineer Department since the organization of the Philippine expedition in May, 1898:

I reported for duty with the expeditionary forces to the Acting Adjutant-General, Department of California, May 13, 1898, and later to Maj. Gens. E. S. Otis and Wesley Merritt.

Application was made at once for engineer troops, both regular and volunteer, and for funds to outfit the expedition.

For troops there came later in May Company A, Battalion of Engineers (3 officers and 60 men, afterwards recruited to 120), and funds sufficient for all purposes.

During the month of June a complete outfit necessary for an army of 20,000 for one year's service, including a siege, was purchased and loaded on the steamer *Morgan City*, sailing from San Francisco on June 27, 1898.

Lieut. W. D. Connor, with 20 men, left with the second expedition, Lieut. Charles P. Echols following with 100 on the *Indiana* on June 27, and myself on the *Newport* on the 29th. The latter vessel arrived in

Manila Bay July 25, and I found Lieutenant Connor's detachment just moving from Cavite to Camp Dewey. With this party Lieutenant Connor and myself made a reconnaissance of the front around to San Pedro Macati, and Lieutenant Connor repaired roads and bridges in several places. The remainder of the company came into camp a few days before the advance on Manila, each portion being assigned to a brigade of the division under General Anderson and coming into the city with the other troops.

In August Lieutenant Connor was assigned to duty in charge of the waterworks, and Lieutenant Echols being sick and afterwards ordered home, the company was commanded by Lieut. W. G. Haan, Third U. S. Artillery, from that time till March 11, when Capt. F. R. Shunk reported and took command of the company.

Prior to the outbreak of hostilities the company was employed in making reconnaissances as far out as they were allowed to go (in one case a party was captured and held at Malolos as prisoners for two days) in surveying the city and repairing roads and bridges.

On February 5 the company acted as infantry, assisting the First California Volunteer Infantry in the capture of San Pedro Macati. A few days later they made a reconnaissance beyond this point and had some sharp fighting.

From the time Captain Shunk took command the company has constructed and repaired a large number of bridges, made several ferries, done reconnaissance work in many places, removed sunken cascoes loaded with stone at two points in the Pasig River, demolished walls in the town of Pasig, and repaired roads at various places. In addition to this, when General MacArthur started his advance on Malolos two detachments were sent out: one with the right, under Captain Shunk, to build a footbridge over Tuliahan River, and one with the left, under Lieut. W. F. Wooten, to assist in repairing the railroad and remain with the command indefinitely.

After building the footbridge on the right the detachment under Captain Shunk also, contrary to my intention, went on with the command to Malolos, where the two detachments were united in one under Lieutenant Wooten. This consolidated detachment has been with General MacArthur ever since and has done excellent work.

The company has now about the same strength with which it started out, and has three officers, Capt. F. R. Shunk, Lieut. W. P. Wooten, and Lieut. Horton W. Stickle, all of whom have cooperated to do rapid and efficient work.

With the assistance of enlisted men detailed from the company, and with transportation furnished by the quartermaster, I have been enabled to furnish promptly all tools and materials called for from all points of the line; have furnished such maps as could be obtained to all parties asking for them, and by furnishing instruments and material have gotten some very good reconnaissance by line officers.

Very respectfully, your obedient servant,

CHAS. L. POTTER,
Lieut. Col., U. S. Volunteers, Chief Engineer.

The ADJUTANT-GENERAL,
Department of the Pacific and Eighth Army Corps.

REPORT OF LIEUT. W. G. HAAN, THIRD ARTILLERY.

HEADQUARTERS COMPANY A,
BATTALION OF ENGINEERS,
Manila, P. I., March 5, 1899.

SIR: I have the honor to submit the following report of the operations of Company A, Battalion of Engineers, while under my command, from September 7, 1898, to March 5, 1899.

Soon after I was placed in command of the company the city limits were established for the purposes of military government. It was found that all Spanish maps of the city and suburbs were inaccurate and a survey was required. This work took about six weeks, and the map,[1] herewith submitted, was made entirely from our own notes and is as accurate as can be made by the prismatic compass and tape surveys.

The company was also engaged in building and repairing bridges and roads in and about the city, making accurate surveys for camps, drainage, etc., superintending the grading of streets, inspecting and keeping in repair the electric-light system of Manila.

Draftsmen were detailed in the office of the chief engineer and temporarily in other departments.

A number of the members of the company have been more or less permanently detached for surveying and doing other engineering work in the various departments.

The company was not permitted to go outside our lines for the purpose of map making, but I have been myself or sent detachments over all important roads in the province of Manila to verify Spanish maps, and have thus been enabled to supply the Army with reasonably accurate maps of the surrounding country. The commanding officers of all organizations having been supplied, when hostilities broke out the company took its place on the fighting line and a report of its action on February 5, 1899, is hereto annexed.

The entire army was amply supplied with engineering and intrenching tools, so that wherever the line stopped it could be immediately intrenched. These tools were supplied from the depot of the chief engineer, where, under the direction of the Chief Engineer, Eighth Army Corps, men of the company with sufficient transportation were in readiness to instantly supply all demands. The possession of two spring wagons and good ponies in this depot greatly facilitated the quick delivery of the lighter articles, while the heavier articles, such as bales of sand bags, shovels, and picks, had to be hauled in bull carts.

On February 15 I took the company out for a reconnaissance in force and became attached to part of the First Brigade, First Division, mak-a demonstration against Pateros, near Laguna de Bay. The company here developed a considerable force of insurgents, and was under fire for about an hour and a half, our supports having withdrawn without our knowledge. The men behaved magnificently under fire and a terrible heat, five of them being partially overcome by the hot sun. The distance passed over this day was 27 miles of rather difficult ground and on a very hot day. The nature of the country was learned and the object of the reconnaissance fully accomplished.

In this connection I wish especially to mention Private John Varney, jr., who volunteered to go out in the open field to recover a haversack belonging to another man in the company and which had been dropped. He was fired upon by about ten Insurgents from a distance of about 200 yards and showed the greatest coolness and courage while under this heavy fire.

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[1] Not printed.

Since hostilities began the company has repaired all roads and bridges, built new bridges where necessary, also a new road to center of First Division line, keeping the line supplied with all necessary engineer supplies, maps, etc.

Accurate maps of all Insurgent and American trenches and the position of the troops are indicated on maps[1] herewith submitted.

The conduct of the company while under my command has been most excellent, and their information and intelligence of such a high order that discipline is maintained and all work performed, not from fear of punishment for neglects nor from hope of reward, but from a high sense of duty well performed, such as one would expect rather from officers than enlisted men.

Maps[2] herewith submitted are self-explanatory.

Very respectfully, your obedient servant,

W. G. HAAN,
First Lieutenant, Third Artillery,
Commanding Company A, Battalion of Engineers.

The CHIEF ENGINEER,
Eighth Army Corps.

REPORT OF LIEUT. W. P. WOOTEN, CORPS OF ENGINEERS.

SAN FERNANDO, *May 17, 1899.*

SIR: I have the honor to submit the following report concerning the operations of my detachment of engineers from March 23, 1899, to April 30, 1899:

On the morning of March 23 I went out to Caloocan under instructions from the Chief Engineer, Eighth Army Corps, and assumed command of a detachment of 2 noncommissioned officers and 20 privates from Company A, Battalion of Engineers, which had been sent out the night before to accompany General Wheaton's brigade in the advance which was to be made from that point.

The detachment remained at Caloocan until the morning of March 25, when the advance began. Our tools and material had been loaded on railway cars and our train followed immediately in rear of the firing line. By noon, the troops having advanced to within 900 yards of the Tuliahan River, a halt was ordered until the following afternoon, when the advance was resumed. As soon as the enemy had been driven from their trenches on the north bank of the Tuliahan, the engineers' cars were pushed by hand down to the railroad bridge. Here it was found that the track had been destroyed over the bridge and for a distance of 150 yards on the south side, while on the north side the roadbed had been entirely cut away for a short distance, and in another place an embankment had been thrown across the road. The ironwork of the bridge was uninjured, but an effort had apparently been made to destroy one abutment. Our first work here was to lay a footbridge, over which some of the troops of the brigade passed, the others having previously crossed at points above and below this bridge. At 4 o'clock I began repairing and relaying the track with the help of 50 Chinamen, whom Major Devol, the transportation quartermaster, had placed at my disposal. By working continuously, stopping only for meals, this was completed by noon the following day, March 27, and by 6 p. m. the track had been repaired to Malinta, where the brigade camped for the night.

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[1] Not printed.

By noon of the 28th we had advanced to Marilao, making a few necessary repairs to the railroad as we advanced.

At Marilao the detachment planked over the railroad bridge for the wagon train, completing the work in about one hour and a half. We camped at Marilao for the night. Next day (March 29) the track was repaired as far as Bocaue, most of the damage done consisting in the removal of the fish plates and spikes from portions of the track. Arriving at Bocaue about 5 p. m., the railroad bridge near there was planked over and the wagon train started across it by 7 o'clock.

March 30 I was directed to assist Captain Shunk and his detachment in the construction of a ferry across the Bigaa River. This work having been completed, in the evening my detachment marched to Guiguinto, arriving there about 11 p. m.

On the following day, March 31, Malolos was captured, and it was found that the railroad track for the distance of about half a mile before reaching the station had been utterly destroyed. In addition to my detachment, the transportation quartermaster furnished a detail of 20 white men and 50 Chinamen, and by noon April 2 the track was completed.

After arriving at Malolos the detachments commanded by Captain Shunk and myself were combined and reduced, Captain Shunk returning to the company at Malate and I being left in command of a detachment of 4 noncommissioned officers and 30 men. While at Malolos the detachment constructed about 20 bamboo footbridges and 1 wagon-road bridge, and dug out two 6-inch breech-loading rifles which had been buried by the Insurgents.

On the morning of April 13 we were sent out toward Paombon to repair a bridge which had been burned by the insurgents in an early morning attack. A few insurgents still remained in the vicinity and kept up a desultory fire on the bridge while it was being repaired, but no casualties resulted.

On the evening of April 23 the detachment with 10 men furnished by the quartermaster and 12 men by the Kansas regiment were sent out 3 miles beyond our outposts and within a mile of the Insurgent lines, to repair a portion of the track for the advance which was to be made by our troops on the 25th. This work was completed and the detachment returned about 11 o'clock at night.

When the Insurgents were driven from the Bagbag River on the 25th it was found that a span of the iron bridge (railroad) about 65 feet long, at that point, had been cut, and the railroad track entirely destroyed from there to beyond the Rio Grande at Calumpit, about 2 miles distant. A footbridge was constructed over the broken railroad bridge, across which the troops passed the next morning. As soon as the troops passed over we began the construction of a wagon bridge. This involved the planking over of the three uncut spans, the bridging of the cut span, the height of the bridge above the bottom of the river being about 30 feet, the construction of trestlework over 60 feet of roadway which had been cut out to a depth of 10 feet just beyond the north abutment of the bridge, and the cutting away of an earthwork which had been thrown across the road. By working continuously, stopping only for meals, this was completed by 10 o'clock the following morning, April 27.

April 28 and 29 were occupied in the construction of a footbridge and a bamboo ferry over the Rio Grande, the condition of the railroad bridge not permitting it to be planked over for a wagon train. So much damage had been done the railroad track and bridges between the Rio Bagbag and Rio Grande that it was not deemed advisable to employ the engineer detachment in repairing it, as the detachment would be needed for other purposes during the time that such extensive repairs would necessarily take.

Very respectfully, your obedient servant,

W. P. WOOTEN,
Second Lieut., Corps of Engineers, Commanding Detachment.

The CHIEF ENGINEER,
Eighth Army Corps, Manila, P. I.

REPORT OF CAPT. F. R. SHUNK, CORPS OF ENGINEERS.

HEADQUARTERS COMPANY A,
BATTALION OF ENGINEERS,
Manila, P. I., June 30, 1899.

COLONEL: I have the honor to submit the following report of the operations of Company A, Battalion of Engineers, since March 11, 1899. The reports of the detachments which accompanied the advance to Malolos have been submitted.

On March 18–19 Sergeant Fischer and five men made a foot reconnaissance from San Pedro Macati to Pasig and thence to Pateros. This detachment on March 19 built a ferry (trail bridge) at Pateros.

On March 15 it was reported that the Pasig River was obstructed near Guadalupe by sunken cascos filled with stone. Sergeant Kennedy, Corporal Fifield, and nine men were sent thither on March 16, and found that two cascos required removal. The stone was of such size as could be handled, and much of it was removed by hand. The cascos were then blown up. This work was finished on March 20. The detachment then moved to the Laguna de Bay at the entrance to the Passig River, where other cascos had been sunk. Four of these were obstructive, and were removed by blasting with dynamite.

On March 18 Sergeant Freeman and 10 men were sent to repair the worst places in the road between San Pedro Macati and Pasig. They worked at this until March 23, when the men were needed for the expedition to Malolos above referred to.

On March 26 Sergeant Freeman and three men were sent to Pasig to demolish stone partition and foundation walls in order to clear the ground in front of the outposts. This work was done by blasting with dynamite, and was finished April 12.

Reconnaissances were made from Malolos to San Fernando, and from Malolos to Baliuag, May 3–7, by Sergeant Fischer and nine men.

Five men of the company made a reconnaissance, May 18–23, of Malabon and vicinity, and from Caloocan to Malolos along the railroad.

On June 14 it was reported that the bridge at Parañaque was in need of repair. This bridge was about 250 long, with a roadway of bamboo and mats, supported by trestle bents 12 or 15 feet apart. The whole structure was old and shaky. It was found necessary to renew a few of the uprights and all of the transoms. A new roadway of plank supported by balk was put in. This work was done by Lieutenant Stickle with 6 noncommissioned officers and 27 men. It was finished on June 19.

Lieutenant Stickle, with 1 noncommissioned officer and 10 privates, then went on to Zapote, where the timbers of one span of the roadway bridge had been partially burned. These were strengthened by bolting on auxiliary pieces, and a new roadway was put in. This work was finished on June 21. On June 21 Lieutenant Stickle, with two noncommissioned officers and seven privates, went to Quingua to construct a trail bridge ferry; at the date of this report the work was unfinished. On June 25 two noncommissioned officers and 25 privates went to Bacoor, where work similar to that at Zapote had to be done on the bridge; it was finished June 28.

The detachment then proceeded to Imus, where one arch of a stone bridge was down. A temporary bamboo structure had been put in, but was deemed unsafe, a mule having fallen through. The gap was closed by a wooden bridge 42 feet long from the middle pier to the bank, supported by two intermediate trestle bents. This was finished June 30. June 25–26 a foot reconnaissance was made from Calumpit to Quingua by 6 privates of the company.

Respectfully submitted.

Francis R. Shunk,
Captain, Corps of Engineers.

Lieut. Col. Charles L. Potter,
Corps of Engineers, U. S. A.,
Chief Engineer, Department of
the Pacific and Eighth Army Corps.

F F F 2.

EXPLORATIONS AND SURVEYS IN THE DEPARTMENT OF THE COLUMBIA.

REPORT OF CAPT. HENRY P. M'CAIN, FOURTEENTH INFANTRY, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

Engineer Office,
Headquarters Department of the Columbia,
Vancouver Barracks, Wash., July 10, 1899.

Sir: I have the honor to submit the following report of operations in this office for the fiscal year ending June 30, 1899:

The office was in charge of First Lieut. John B. Bennet, Seventh Infantry, aid-de-camp, from date of last report until January 2, 1899, when he was relieved by the undersigned, per paragraph 2, General Orders No. 1, current series, Headquarters Department of the Columbia.

As no officers were available for topographical duty, no fieldwork has been done since date of last report.

The office work performed was as follows:

Tracing of Habersham's map of Alaska; tracing of map of the Suchitna River, Alaska; tracing of country between Chinaldna and Talkeetna rivers, Alaska; tracing of Scarborough Head Military Reservation, Washington; tracing of plan of new post at Fort Stevens, Oregon.

Thirty-four black prints have been made, 16 maps mounted on muslin, and seven maps and plans drawn by hand.

Two hundred and sixteen negatives were developed and upwards of 600 silver prints made for the Alaska exploring expeditions of 1898.

Very respectfully,

Henry P. McCain,
Captain, Fourteenth Infantry, Engineer Officer.

Brig. Gen. John M. Wilson,
Chief of Engineers, U. S. A.

F F F 3.

EXPLORATIONS AND SURVEYS IN THE DEPARTMENT OF THE COLORADO.

REPORT OF LIEUT. JOHN B. BENNET, SEVENTH INFANTRY, AID, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

ENGINEER OFFICE,
HEADQUARTERS DEPARTMENT OF THE COLORADO,
Denver, Colo., July 28, 1899.

SIR: I have the honor to submit the following report of this office for the year ending June 30, 1899:

PERSONNEL.

Second Lieut. E. L. King, Eighth Cavalry, remained in charge of the office from June 30, 1898, to September 6, 1898, when he was relieved by First Lieut. J. McA. Palmer, Fifteenth Infantry.

Lieutenant Palmer had charge of office until relieved, January 30, 1899, by First Lieut. J. B. Bennet, Seventh Infantry, the present incumbent.

From June 30, 1898, to November 21, 1898, there was no clerk in this office, owing to the resignation of Mr. Charles Kern, May 31, 1898, and no regular clerk having been assigned.

From November 21, 1898, to June 30, 1899, the services of a temporary clerk were furnished.

OFFICE WORK.

Other than indexing the large number of maps on file in the office and keeping account of the property issued to post engineer officers on memorandum receipt, but little has been done. Fortunately the demand for maps has been small and this office has not been called upon for any extensive topographical drafting during the year, as otherwise the requirements could not have been complied with for want of a competent draftsman.

Very respectfully,

JNO. B. BENNET,
First Lieut., Seventh Infantry, Aid, Acting Engineer Officer.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

APPENDIX G G G.

CONSTRUCTION OF MILITARY ROAD FROM FORT WASHAKIE TO MOUTH OF BUFFALO FORK OF SNAKE RIVER, WYOMING.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

UNITED STATES ENGINEER OFFICE,
Sioux City, Iowa, July 14, 1899.

GENERAL: I have the honor to submit the following report of operations during the fiscal year ending June 30, 1899, on the construction of a military road from Fort Washakie to the mouth of Buffalo Fork of Snake River, Wyoming:

The work has been done under an appropriation of $10,000 contained in the sundry civil act of June 4, 1897.

I was placed in charge of this work by special order dated July 21, 1898. No work had been done between July 1, 1898, and that date. A party having been organized and outfitted at Fort Yellowstone, and transported to the point of beginning road construction, near the mouth of the Buffalo Fork, work on the road was begun August 25. It was completed October 7, so far as contemplated by the approved project for the expenditure of the above appropriation.

The road constructed is 53.8 miles in length, and joins existing roads at the mouth of the Buffalo Fork and on the east side of the mountains, near Clark's ranch, so as to form a continuous route from Fort Washakie to Jacksons Hole and the Yellowstone National Park. The survey of the road was completed October 8. A detailed report on this work, containing map of the road built and photographs showing character of country traversed by it and by the road between Clark's and Fort Washakie, was submitted February 3, 1899, and was printed in House Doc. No. 245, Fifty-fifth Congress, third session, which is hereto appended, and to which reference is respectfully made for details of work accomplished and of future requirements.

The expenditures during the year have been $9,723.07.

The appropriation not being sufficient to construct a road from Fort Washakie to the mouth of Buffalo Fork, its expenditure was of necessity limited to the impassable section, crossing the Rocky Mountain Divide, west of Clark's. This section has been made passable, though the road built should be considerably improved. The existing ranch roads connected with at each end of the military road are very bad, and should be greatly improved or new roads built. For improving the old road leading from Fort Washakie to the junction with the military road above Clark's, or for building a new road between these points, as may be found most advantageous, and for improving the military road built in 1898, an estimate of $40,000 is submitted. A good road should also be constructed, or the existing one improved, between the mouth of Buffalo Fork and the south line of the Yellowstone Park Timber Land Reserve (to which the park road system extends), in order to make the whole upper portion of Jacksons Hole easily accessible from either Fort Washakie or Fort Yellowstone, and to furnish a good through road to the Yellowstone Park from Wyoming. For this purpose an estimate of $10,000 is submitted, or $50,000 in all, for the through route from Fort Washakie to the Yellowstone Park. This expenditure will, it is believed, result in a road that will satisfy all present requirements. The annual cost of maintenance of the through route, when completed, I would estimate at $4,000.

Congress having made no provision for continuing operations, authority was asked and obtained to drop this work from the list of works in my charge. The unexpended balance, $157.68, not needed for payment of outstanding liabilities to be paid at the Sioux City office, was turned into the Treasury June 30, 1899, and no further report will be submitted unless the work should be revived by future appropriations.

Money statement.

July 1, 1898, balance unexpended		$9,890.75
June 30, 1899, amount expended during fiscal year		9,723.07
July 1, 1899, balance unexpended		167.68
July 1, 1899, outstanding liabilities		150.65
July 1, 1899, balance available		17.03
Amount (estimated) required for completion of road from Fort Washakie to Yellowstone Park		50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1901:		
For works of improvement	$50,000.00	
For maintenance of improvement	4,000.00	
		$54,000.00

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT ON CONSTRUCTION OF MILITARY ROAD FROM FORT WASHAKIE TO MOUTH OF BUFFALO FORK OF SNAKE RIVER, WYOMING.

[Printed in House Doc. No. 245, Fifty-fifth Congress, third session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, February 14, 1899.

SIR: I have the honor to submit herewith a report with maps,[1] of February 3, 1899, by Capt. J. C. Sanford, Corps of Engineers, on the construction of a military road from Fort Washakie, Wyo., to the mouth of the Buffalo Fork of Snake River, Wyoming, for which an appropriation of $10,000 was made in the sundry civil act, approved June 4, 1897, and to recommend that the same be transmitted to Congress for its information.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

HON. R. A. ALGER,
Secretary of War.

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[1] Not reprinted. Printed in House Doc. No. 245, Fifty-fifth Congress, third session.

REPORT OF CAPT. JAMES C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Sioux City, Iowa, February 3, 1899.

GENERAL: I have the honor to submit the following report on the construction, during the latter part of 1898, of a military road from Fort Washakie, Wyo., to the mouth of Buffalo Fork of Snake River, Wyoming, provided for in the sundry civil appropriation act approved June 4, 1897.

The item of appropriation reads as follows:

> Military road, Wyoming: For the construction of a military road from Fort Washakie, Wyoming, by the most practicable route near the Wind River and to the mouth of the Buffalo Fork of Snake River, near Jacksons Lake, in Uinta County, Wyoming, to be expended under the direction of the War Department, ten thousand dollars, or so much thereof as may be necessary.

I was directed to assume charge of this work by special order dated July 21, 1898, taking station at Fort Washakie, Wyo., the funds and property belonging to the work and in the hands of the Quartermaster's Department to be transferred to me. A subsequent order, of July 30, 1898, amending this, directed me to take station at Fort Yellowstone, Wyo., a change which, as the proposed work was on an average about 100 miles nearer the Northern Pacific than the Union Pacific Railroad, effected, undoubtedly, a considerable saving in time and expense. By your indorsement of July 26, 1898, on letter of the Quartermaster-General, dated July 24, 1898, I was furnished with all the papers on file in the Quartermaster-General's Office relating to the work; and all information on this subject on file at the office of the chief quartermaster, Department of the Colorado, and at the office of the post quartermaster at Fort Washakie was sent me soon after.

HISTORICAL.

These papers showed that a bill providing for the construction of a road between the above points, and appropriating $20,000 therefor, had been introduced in the House of Representatives January 21, 1896, but had failed to become a law. The purpose of the proposed road, as shown by the correspondence, was to render it possible to move cavalry from Fort Washakie with their supplies, by as direct a line as possible, into Jacksons Hole, a noted game country, much frequented during the hunting season by Indians of the Fort Hall and Wind River reservations, and where conflicts between these Indians and the Wyoming State game wardens were to be feared. Troubles of this kind in the summer of 1895 had necessitated the sending of a considerable number of troops into the Hole. They, with their supplies, came in from the west, via Market Lake, on the Utah Northern Railroad, and the Teton Pass.

General Coppinger, then in command of the Department of the Platte, in his report on the above bill, says:

> So long as the Indians of the Fort Hall and Wind River reservations do not surrender the hunting privilege accorded them by treaty there will be danger of conflicts between them and lawless whites in the Hole, which the cavalry at Fort Washakie would be in the best position to put down. Even if the Indians relinquish this privilege, the troops might still have to police the hunting grounds to prevent encroachments thereon by the young bucks, naturally reluctant to forego their annual sport.

On the passage of the act of June 4, 1897, the work was placed in charge of the Quartermaster's Department; and on August 8, 1897, a plan and map for locating the road, prepared by Lieut. Howard R. Hickok, Ninth Cavalry, were submitted, as directed, by the commanding officer of Fort Washakie, who states also:

> I am informed that a reconnaissance of To-Gwo-Tee Pass and the trail along Buffalo Fork and Black Rock Creek will be shortly made under the engineer officer of the Department.

On August 24, 1897, the Judge-Advocate General decided that, as the amount appropriated fell far short of the amount required to complete the work, the appropriation could not, by its terms, be used as far as it would go, leaving the work incomplete. In August and September, 1897, a reconnaissance was made by Lieut. A. J. Perry, Ninth Cavalry, engineer officer of the department, and Lieut. J. A. Ryan, Ninth Cavalry, for the purpose of determining "the best practicable route over the Rocky Mountain Divide near the head of Wind River." Their report, dated September 5, 1897, with accompanying map, is appended (marked Appendix A). As a result of the reconnaissance, Lieutenant Perry suggested to the commanding general of the department that, if the whole of the appropriation were expended on the section of the road from Clark's ranch to the mouth of the Buffalo Fork of Snake River, that section could be made passable; and, as the road from Washakie to Clark's was already passable during the greater part of the year, the result of spending the whole of the appropriation between Clark's and the mouth of Buffalo Fork would be to give a passable road over the entire route. The matter was, therefore, again referred to the Judge-Advocate-General, who decided, under date of February 15, 1898, that, as the road as a whole would be completed by such expenditure, the appropriation could legally be used in that way.

In March, 1898, Capt. John T. McBlain, Ninth Cavalry, was detailed to take charge of the construction, and preparations begun, in order that work might commence not later than June 15 (the necessity of beginning work about June 15 is also stated in Lieutenant Perry's report of February 2, 1898. He says:

> The season for working being very short, namely, between June 15 and September 30, it is recommended that the funds be made available, and such preliminary work, such as procuring labor, teams, etc., be done, so as to allow the working party to start work not later than June 15).

Tools to the value of $109.25, delivered at Fort Washakie, were purchased, but the breaking out of the war with Spain put a stop to further preparations. The approved project, recommended by Lieutenant Perry, may be stated to be the construction of a passable wagon road between Clark's ranch and the mouth of Buffalo Fork. Bridging the Buffalo was not recommended, in view of the small appropriation, and it is thought, from the correspondence, that the bridging of smaller streams was also for the same reason not contemplated.

NARRATIVE OF THE WORK.

In accordance with the above-mentioned order of July 30, 1898, I reported at Fort Yellowstone August 8, and opened an office there for the hiring of labor and teams and the purchase of the necessary supplies and equipment. Lieut. G. O. Cress, Fourth Cavalry, post quartermaster, had kindly, at my telegraphic request, posted and sent out to towns in the vicinity notices announcing that labor and teams would be needed for this work. A clerk, an assistant engineer to take charge of locating party, a master laborer, a steward, a rodman, and a carpenter and blacksmith had previously been engaged. All these arrived at Fort Yellowstone between the 9th and 11th. Previous investigation and correspondence having shown that the road would cross the mountains at an altitude of over 8,000 feet and that this pass was likely to be completely closed by snow as early as October 1, it was evident that a force should be provided for large enough to complete the work, so far as the appropriation would complete it, by about October 1, and that, as the season was already far advanced and as the point of beginning work was about 120 miles from Fort Yellowstone, no unnecessary time could be spent in organizing and outfitting the parties.

Two parties were provided for—a locating party, to precede the main party by as many days as possible and to be transported, with its supplies and outfit, by a pack train; and a construction party, to be transported, with its supplies and tools, by a wagon train and such saddle horses as would be afterwards needed for superintendence, messenger service, etc. Copies of maps and reports for the use of the locating party were prepared while the party was being organized and its outfit purchased or hired. This party, in charge of Asst. Engineer W. H. Wood, left Fort Yellowstone August 15. Their work is described in detail in the appended report of Assistant Wood (Appendix B). After their locating work was completed, the party made a survey of the road as constructed, a map showing results of which accompanies Mr. Wood's report. The pack train was returned to its owner in September when no longer needed.

In the organization of the construction party the rates of pay adopted were made to conform with those being paid at the time for similar work on the road system of the Yellowstone National Park. These rates, for a teamster with a 2-horse or 4 horse team, were, respectively, $3.24 and $4.98; but in the park work oats were furnished by the owners of the teams, which, as oats were very scarce in Jacksons Hole, and practically unobtainable at the head of Wind River, made it necessary, in order that the teams might be used in hauling the tools and supplies from Fort Yellowstone, that the Government should furnish the oats and deduct therefor from the above figures, in order to equalize rates with park rates, what, on an average throughout the territory covered by the park work, would be the cost to the team owner. This rate was fixed at 2 cents a pound, and the daily oat ration for one team horse at 12 pounds. With each team, 2-horse or 4-horse, one wagon complete and in good condition was required to be furnished.

Arrangements were made at Fort Yellowstone for the delivery of oats at regular intervals at Snake River Station, a substation of Fort Yellowstone, 93 miles south of the fort and near the south boundary of the park; also for the delivery of the second month's subsistence stores and of mail at this station. Freight wagons were to be sent, at fixed times, from the road work to receive the supplies, while the mail was to be carried between the station and the road work by a mounted messenger. Through the energy and attention given to this service by Lieutenant Cress and by Sergt. Valentine Loeb, Fourth Cavalry, in charge of the station, the results, considering the difficulties due to distance and slow communication, were remarkably good. To complete the work within the time remaining would, it was estimated, require about 28 working horses in 2 horse and 4-horse teams, with their drivers, and about 48 laborers experienced in various classes of road work.

A sufficient number of teams were engaged at Fort Yellowstone, but the number of men applying for work as laborers was comparatively small. It was necessary to engage every able-bodied man that applied, and when the party left the fort the quota of laborers was not nearly filled. (After arriving in Jacksons Hole applications for work were numerous, mostly from settlers in the Teton Basin, Idaho, who came on an average about 75 miles to reach the work.) It was found impossible to secure a thoroughly competent cook for such a force in the vicinity. In the matter of procuring quickly the necessary tools and mess outfit great assistance was rendered by Capt. J. B. Erwin, Fourth Cavalry, acting superintendent of the park, in charge of road construction, and by Lieutenant Cress, post quartermaster.

On the afternoon of the 17th, all supplies, tools, tentage, etc., having been loaded on the wagons, the party moved up the long ascent between the fort and the head of the Golden Gate, or Kingmans Pass, 4 miles, and made camp. An early start was made on the morning of the 18th, and from that time until Snake River Station was reached, on the night of the 22d (camp was not moved on the 21st, Sunday), good progress was made.

On the 23d the party moved 21 miles to Pilgrim Creek, about 7 miles from the mouth of Buffalo Fork. The latter half of this day's march was over a very hilly and stony road, crossing the high ground on the east side of Jacksons Lake, and several accidents to the wagons occurred, which were temporarily repaired in the evening. At 8.10 a. m. on the 25th the party reached the ranch of Ed. J. Smith, on the Snake River, about 4 miles above the mouth of Buffalo Fork. Here I received a communication from Assistant Wood, stating that on account of shortness of time available his party had not been able to stake out the line selected up to the point where it crossed the Buffalo, about 14 miles from the mouth, and that Mr. Smith, who had accompanied the locating party, would point it out to me. In company with Mr. Smith, therefore, I rode ahead of the party to a point from which the crossing and the line leading to it could be plainly seen. A very bad ranch road led down the valley of the Snake and up that of the Buffalo as far as Joe Smith's ranch, about 6 miles above the mouth, where it crossed the Buffalo, and continued a few miles through the meadows on the south side of the Buffalo Fork and Black Rock Creek, terminating near the head of these meadows.

At Joe Smith's a ridge or mountain spur, about 400 feet high at the point, projected into the bed of the Buffalo, the slope toward the stream being very steep. A ravine, with wide bottom, had been found, which led by a very gentle slope to a point where the ridge could be crossed at a height of only about 350 feet above the stream. From this point, by following a succession of swales, located somewhat like the branches of a "switch back," the descent on the west side could be easily made down to a height of about 150 feet, from which point the general slope of the ridge became comparatively gentle. The ravine and swales were partly filled with small timber, pine and aspen. Considerable grading and one bridge would be required to make a good road. Beyond this point the work to be done consisted in preparing crossings of several tributaries, some of which had high steep banks, and in clearing considerable timber and brush on the lowlands. In many places side-hill grading would be advantageous, but it was believed that time and funds would not permit this. Much valuable information regarding the country between his place and the Black Rock Meadows was given me by Mr. Smith during this ride.

On my return to Joe Smith's, camp was made there (designated as camp No. 1 on map accompanying Mr. Wood's report). Much difficulty was encountered by the wagons in reaching this camp. One wagon had been mired for about two hours in a marsh, and at two points where ridges encroached on the river the wagons were prevented from upsetting by the weight of several men on long levers.

From this camp construction work, beginning on the morning of the 25th, was carried on in both directions. The road over the ridge was constructed on the line above described, and some heavy grading done at the crossing of a wide stream with high, steep banks, located about half a mile from the west toe of the ridge. A party also went back and made passable the ranch road leading to Joe Smith's. On the 27th camp was moved about 8 miles to the selected crossing of the Buffalo (designated as Camp No. 2). In this move a large working party preceded the main party, to clear the road and prepare crossings of streams. One bridge was built. Whenever the main party was halted by an obstacle all the available men assisted.

During this march the most easterly house (Randolph's) in the Buffalo Fork Valley was passed, about 4 miles east of Joe Smith's; after which no building of any kind was found until on September 27 the party reached the "Hunters' Cabin," on the east side of the mountains and at the head of Wind River Meadows, 32 miles from Randolph's.

The 28th, Sunday, was spent by the master laborer, Fred L. Walker (afterwards overseer), and myself in reconnoitering the line by which the ascent from the Buffalo Fork to the top of the high divide, about 1,000 feet above the Buffalo, was to be made. A line had been blazed by the locating party, but, as they were under orders to examine the entire length of the proposed route and to return and report results by September 1, their location of the road could only be regarded as provisional. The blazed line contained some long grades regarded as too steep to be adopted unless absolutely necessary.

A thorough exploration of the north slope of the divide, which for the most part was covered with heavy pine timber, containing much fallen timber, had to be made, resulting in the discovery before night of a practicable ravine, on the bottom and on the left bank of which a line, without extremely heavy grades, could be carried. The change in location involved crossing the Buffalo at a ford about a half mile above the point originally selected. The general location being thus chosen, daily reconnaissances in advance of the working party had to be made for the thorough examination of all alternative routes between points on the general line, in order to secure the best possible grades with the least expenditure of time and money and to place the road in positions promising the greatest permanency. These remarks, as to the large amount of reconnoitering needed and made, apply equally to the work of each succeeding day until the road was completed.

On crossing the Buffalo the character of the country changes greatly. As above stated, the road ascends directly from the Buffalo to the top of a high divide, whose elevation above sea level is about 8,000 feet, and for the next 34 miles the road is at or above that elevation. Beginning at the Buffalo, perhaps one-half of the country on the west slope of the mountains is covered with dense timber, mostly coniferous, the remaining spaces being mainly park-like openings along the courses of streams, and covered usually with an abundance of nutritious grasses. These parks are the fall and winter feeding grounds of great numbers of elk and deer. There is every indication of abundant rainfall.

On the 29th, work on the south side of the Buffalo was begun, and on that day and the 30th the ford of the Buffalo was improved and the road constructed to the site of Camp No. 3, about 5 miles beyond Camp No. 2, involving the building of five bridges, a large amount of timber clearing, and considerable grading. Camp was moved on the 31st and Camp No. 3 established.

From this camp the road was built to the Black Rock Meadows, about 5 miles. The first half of this distance was through timber, part of which was the heaviest that had yet been encountered. One bridge was built. The amount of grading required was comparatively small. Easy gradients were found. On September 3 camp was moved to the foot of Black Rock Meadows, about 5 miles, and Camp No. 4 established. Snow had fallen during the night at the site of this camp, but had disappeared before the arrival of the party. Some still remained on the higher slopes.

In the Black Rock Meadows much heavy grading had to be done, the low ground being too soft to be used. Six bridges were built. It was thought best before moving camp again to carry the work, if possible, as far as the foot of the steep, final slope leading to To-Gwo-Tee or Two-Gwo-Tee Pass [the former is the spelling adopted by its discoverer in 1873, Lieut. Col. (then Captain) W. A. Jones, Corps of Engineers]. For about 3 miles above the head of the meadows the trail follows, more or less closely, the right bank of the Black Rock Creek. The line is crossed at frequent intervals by spurs of broken rock, projecting from the mountains, which are here close to the line. Between these spurs torrents have worn deep ravines with very steep sides. The construction of a passable road through this section would have been extremely slow (probably requiring several weeks) and difficult, and its subsequent maintenance very expensive; but it was believed, from the data at hand, that no better line existed. The fortunate intervention of a Sunday and a holiday (Labor Day) permitted a thorough exploration of the whole region and it was found that an excellent line, which had been hidden by about half a mile of heavy timber, existed on the high ground south of the creek. Less than one day's work with a portion of the party was required to build the road on the new line. It would seem proper to acknowledge here the very valuable assistance rendered in all of these reconnaissances by the overseer, Mr. Walker, who was almost tireless and showed remarkable skill and judgment in the discovery and exploration of possible routes. His energy and ability were no less marked in the superintendence of work; and he deserves a large part of the credit for the completion of the road within so short a time.

On September 9 camp was moved about 7 miles to the "Black Bowlder," a gigantic mass of black volcanic breccia lying near the foot of the main west slope. Just before reaching this, creek crossings had to be improved by the advance working party. The camp, No. 5, was established in a driving snowstorm (after this time the weather was good for nearly three weeks). The above change in the line had necessitated a change in the route to be followed in ascending the slope, which was densely timbered and intersected by numerous deep canyons; but a new and favorable route had been found before moving camp. From Camp No. 5 the road was built across the summit to the outlet of a small lake, designated on the map as Walkers Lake. Eight bridges were built, much clearing and grading, in earth and rock, done, and camp moved about 3½ miles on the 13th to the above outlet, where Camp No. 6 was established. The work had now entered the dense timber, which, beginning at the open country, about 1½ miles wide, at the summit of the pass, extends almost unbroken down the Wind River Valley to the Hunters' Cabin, 8 miles.

The location of the road line through this timber by the locating party is described in Mr. Wood's report. Several minor changes were afterwards made in this line in order to lessen grading. In one case this advantage was obtained in addition to that of throwing the line near the only practicable camp site (that of camp No. 8) from which to carry on the heavy clearing and grading work necessary to make the descent into the Wind River bottom. The work between camps 6 and 9 was by far the heaviest required on the road, that between camps 8 and 9 being especially heavy. Reconnoitering in this forest was also extremely difficult on account of the dense growth, the large amount of fallen timber, and the frequent occurrence of deep canyons.

From camp No. 6 the road was built to the "Long Meadows," about 2 miles, involving a large amount of clearing, grading in rock and earth, and the construction of 6 bridges. Camp was moved on the 15th to the "Long Meadows" and camp No. 7 established. The work between camps 7 and 8 involved a descent from the "Long Meadows" into the valley of a tributary of Wind River, the crossing of this and six other streams by bridges, clearing of the line and of a short branch line into the "Big Meadows," and considerable grading in earth. Camp No. 8, in the "Big Meadows," 3 miles from camp No. 7, was established on the 19th, and no further move was made until the 27th.

From this point to the top of Wind River Point, about 1½ miles, the clearing was the heaviest found on the line. Near the "Big Meadows" many very large trees were found. One spruce, near the road, a double tree, forking about 5 feet from the ground, measured 15.2 feet in circumference 2½ feet above the ground. It was about 125 feet in height. Many of the single trees, pine and spruce, had a diameter of over 3 feet. At about 1 mile east of the "Big Meadows" the growth becomes smaller, quite uniform in size, and very dense, the average size being about 9 inches in diameter and 75 feet in height, the trees being spaced, over areas of considerable size, at an average distance apart of about 3 feet. An immense forest fire had swept the eastern part of this growth, beginning just west of Wind River Point and extending to the Hunters' Cabin. The same fire had also destroyed much of the timber on the north slopes below the Hunters' Cabin. Part of the burnt timber was standing, but more than half had fallen. The road having been cleared to Wind River Point, grading on this, the most serious obstacle on the whole line, was begun. The point lies in the acute angle formed by the canyon of Wind River and by that of a small tributary. Slides had occurred on the sides of the point into both canyons, narrowing the point at top and preventing much development of line on the descent.

The natural slope, in the direction of the road, was at the top about 25 per cent, and at two other points considerably exceeded 20 per cent. By cutting down the top of the slope 14 feet at one side of the point and by heavy sidehill grading at the two other sections mentioned, the maximum gradient was reduced to 20 per cent, the total length of which in the three sections is 1,200 feet. A bridge was built over the tributary, the road cleared to the Hunters' Cabin, the ford of Brooks Lake Fork improved, and considerable grading in earth and rock done between the point and Hunters' Cabin. On the 27th camp was moved 3½ miles to a point on the Wind River a short distance above Hunters' Cabin.

From this latter point the road was carried about 3½ miles along the slopes on the left of Wind River Meadows, clearing and grading being required on portions of the line; it then turned east from the meadows and followed a natural depression, about 1½ miles in length, between two high ridges, to the West Branch of Long Creek. One bridge was built.

On the afternoon of the 29th camp was moved 7 miles, and camp No. 10 established on the West Branch. Since leaving Fort Yellowstone, morning frosts, more or less heavy, had been the rule, and on September 10 the minimum temperature had been about zero Fahrenheit. From that time until the 28th, while the morning frosts had usually been quite heavy, the days had been clear and warm. Cold weather, with heavy winds and snow, set in on the 28th, and from that time to the close of the work the weather was cold and wintry.

On arriving at camp No. 10 the trail down Long Creek was at once examined. It was evident that a good and permanent road could not be built on this line without great expense. By night, however, enough had been learned about the country to indicate that a practicable line could be found to the De Noir Valley. A reconnaissance made early on the following morning showed that the two intervening divides could be crossed with easy gradients through a network of ravines and swales. A great many bowlders of all sizes covered the divides, one of the ravines being for a short distance almost filled with them. During the reconnaissance a bridge was built across the West Branch and approaches to it graded. Work was then begun on the new line and pushed rapidly. On the evening of the 30th a heavy snowstorm began, which continued through the following day. From the 30th to the evening of October 6, when the party on their return reached the lower and much warmer Buffalo Fork Valley, all work and moving of camp was done with snow on the ground and during a large part of the time in the midst of snowstorms. On October 1 a party of 6 men and 2 horses, with seven days' provisions, was sent back to widen the timber cutting on the east slope of the mountains where necessary and to build a few bridges which had been omitted during the advance. On the 3d a practicable road had been built to the De Noir Valley, where it joined two fairly good existing roads on opposite sides of the De Noir River, leading, respectively, to Clark's ranch and to the Fort Washakie road below Clark's.

A terrific snowstorm, with a driving wind, prevailed on the 3d, the depth of snow on the ground in the afternoon being about 6 inches. This interfered greatly with finding and removing the smaller bowlders on the line of the road; and it is probable that many of these, where the road crosses diagonally the divide between the East Branch of Long Creek and the De Noir, were not removed. On the morning of the 4th the grades leading from the valley of the West Branch of Long Creek to the divide between the two branches were improved; and at 1 p. m. the return journey to Fort Yellowstone was begun.

About 6½ miles were covered during the afternoon, camp being made near the Hunters' Cabin. On the 5th the steep east slope of the mountains was climbed, the day's march being about 8½ miles, and camp made close to the summit in snow averaging about 9 inches in depth. An advance party, composed of all available men, was employed during this march in removing, mostly by blasting, the worst stumps that had been left in this part of the road. All stumps in the road had, it should be said, been cut down close to the ground, and the work of this day was confined to the removal of stumps left in or close to the wheel ruts. On the 6th the summit was crossed. In this open country the snow had drifted badly, some of the drifts on the road being about 2½ feet deep and of considerable length. After passing the head of Black Rock Meadows the snow gradually diminished in depth, and at the Buffalo ford, where camp was made for the night, after a march of 19 miles, had entirely disappeared. At 3 p. m. of this day the party of six that had been sent back October 1 had practically completed their work near the summit and started west in a heavy snowstorm to overtake the main party, which they joined on the evening of the 7th. Camp was moved about 16 miles on the 7th to a point about 2 miles below the mouth of the Buffalo. The grading crew stopped on this day's march to change the line of the road just below Joe Smith's, carrying it along the slope around a marsh or soft meadow, instead of through the marsh, as formerly. They reached camp in the evening.

On the morning of the 8th a considerable number of the laborers and teamsters were discharged and the march resumed. The survey party completed on this day the survey of the road as built. Considering the time allotted, a large amount of survey work had been accomplished by this party under the direction of Assistant Engineer Wood.

Fort Yellowstone was reached on the afternoon of the 13th, and the office reopened for the settlement of accounts. The return journey through the park had been difficult on account of the condition of the roads, which were covered with snow on the three divides crossed and were very muddy on the lower ground.

The Fort Yellowstone office was closed on the 21st, since which time the platting of survey notes, computations of work done, and preparation of reports have been carried on at the Sioux City office.

The following statement shows the cost of different classes of work, the character of the work being described in Mr. Wood's report:

Cost of work.

Classification.	Cost per item.	Total cost.
Grading, including removal of bowlders, 5,816 cubic yards	$0.7762	$4,514.53
Clearing and partial grubbing, 37.65 acres	48.33	1,819.75
Building 44 bridges	14.90	655.82
Rock grading (ledge), 40 cubic yards	3.53	141.21
Administration		816.64
Engineering, including location, survey after completion, mapping, and reports		1,564.05
Tools and mess outfit		[a] 488.00
Total		10,000.00

[a] Includes $109.25 expended by Quartermaster's Department prior to July 21, 1898.

CHARACTER OF ROAD BUILT.

The length of the road as built, from the mouth of the Buffalo Fork to the junction with the roads in the De Noir Valley, is 53.8 miles; or 57.1 miles from the mouth of the Buffalo to Clark's ranch. Lieutenant Hickok, Ninth Cavalry, in his report of August 7, 1897, on the best route for a road from Fort Washakie to the mouth of Buffalo Fork says:

> The roads of this section are undefined and unimproved, other than the removal of the great obstructions, and it is recommended that the above-outlined road be of the same general character.

While this description would probably apply to the existing roads (there are two lines followed, depending on the season) in the open and comparatively level country between Fort Washakie and Clark's and perhaps to any road that is likely to be built between these points, it would scarcely apply to the road just built across the mountains.

In the total length of 53.8 miles built there are 8⅔ miles of grading, 14.1 miles of clearing, and 44 bridges. Many of the latter are located in an open country, and help to define the road. At a few points, however, and for comparatively short distances, the road is undefined, except by the tracks made by our wagons and by the stakes driven by the survey party. Drainage of the road was not attempted except in a few bad places. As to gradients, the purpose of the road, viz, to make a practicable crossing of the mountains for troops and their supplies in heavy wagon loads, the latter being the essential matter, was constantly kept in mind, and advantage taken of all opportunities to lessen grades without too great cost. Considering both length and steepness, the Wind River Point is much the worst grade on the road, the maximum gradient here, as above stated, being 20 per cent. On our return, with several inches of melting snow on the ground, a heavy freight wagon, with a load estimated at 2,600 pounds, was pulled by its 4-horse team to the top of this grade without greater difficulty than the necessity of resting the horses a few minutes at the summit of each of the three sections of the grade.

I am informed by the acting superintendent of the Yellowstone Park that on the main system of roads in the park, on which large sums have been expended, there are, in the first 4 miles south of Fort Yellowstone, two grades each of 23 per cent, and some of the gradients adopted for streets in this and other cities do not fall far short of 20 per cent. Many of the grades on the road might, however, be improved, should funds be available and travel over the road show the necessity therefor; and, in many places, grading would be advantageous, where, on account of the smallness of the appropriation, no work was done. The bridges built, as described in Mr. Wood's report, are substantial, and should remain in good condition for several years.

A few other small bridges would improve the road, and a bridge over the Buffalo would prevent this river becoming an impassable obstacle in time of flood. It is stated that this river often reaches its highest stage in the early part of July, and that its floods are not of long duration.

To-Gwo-Tee Pass, so far as I can learn, can be crossed about July 1. A bridge over the Buffalo would probably, therefore, prolong by a few weeks the season during which the road, as a through route, can be used. The width of clearing in timber should be increased, both to admit more sunlight and thereby keep the road drier and to lessen the danger of the road being obstructed by falling trees.

The road is now, however, believed to be, with the exception of the Yellowstone Park roads, the best mountain road in that part of the country. By it the distance between Fort Washakie and the northern part of Jacksons Hole, and between Fort Washakie and the Yellowstone Park, is from 50 to 60 miles shorter than by the only other existing road—that over Union Pass—which latter road is said to be practically impassable for even moderate loads. The road as built is also better than that on the east side of Jacksons Lake, and is believed to be better than the Fort Washakie road just below Clark's.

CHARACTER OF COUNTRY TRAVERSED.

A few statements on this subject have been made under "Narrative of the work." Some information in regard to it is also given in the appended reports of Lieutenants Perry and Ryan and of Assistant Wood. A bird's-eye view of the region about the Buffalo Fork and Black Rock Creek, looking toward To-Gwo-Tee Pass, copied from Plate XLIII, Annual Report of the United States Geological and Geographical Survey of the Territories, 1877, accompanies this report. Mr. H. E.

Wadsworth, of Lander, Wyo., with a hunting party, passed over the new road shortly before its completion, coming from the Yellowstone Park. Through his kindness I have been furnished with copies of kodak views taken by him at points along the line of the road and of the road leading from Clarks to Fort Washakie. While these views were not taken to illustrate the road work and do not show the difficult parts of the work, they nevertheless give a very good idea of the character of the country both west and southeast of Clarks. For this reason they are submitted herewith. Nos. 1 to 6 are views taken along the military road, while Nos. 7 to 10 indicate the character of the country and of the present road below Clarks.

The elevated valley known as Jacksons Hole (elevation of Jacksons Lake, between 6,800 and 6,900 feet) is bounded on the west by the Teton Mountains, whose eastern scarp, rising abruptly from the lake and reflected in its waters, presents probably the grandest mountain view to be found in the United States. On the east the valley is bounded by the main divide of the Rocky Mountains, which in a sinuous line follows one of the western ranges of the Shoshone or Absaroka Mountains, and the Wind River Mountains, the average distance from the Teton Mountains to the main divide being about 40 miles. On the south the valley is closed by a spur of the Wind River Mountains, while on the north no marked natural boundary exists between the valley and the Yellowstone Park, even the main continental divide being here but little raised above the general level. The eastern portion of the valley is a high and rolling country, intersected by mountain spurs and watered by numerous streams, which in their upper courses have cut deep canyons.

The whole region, in common with the Yellowstone Park, is remarkable for its heavy annual rainfall, a quite exceptional feature in the arid portion of the United States. The cause of this heavy precipitation has been stated as follows:

> The principal southwest air current, moving over a low portion of the mountain mass of the Pacific Coast, reaches the Tetons and Sierra Shoshone range without being deprived of much of its vapor. It is not only checked in its course by this high cool wall, but the tremendous acicular ridge of the Tetons stands in such a position as to produce a strong eddy about the headwaters of the Snake and over the [Yellowstone] lake basin. (Reconnoissance in Northwestern Wyoming, 1873. Jones.)

As a result of the heavy precipitation, most of the region is densely timbered, and streams and lakes are abundant. In winter the country is covered with a tremendous depth of snow, communication in the valley being impossible only by the use of snowshoes, and the mountain passes remain closed by snow until about July 1. This part of the Rockies has been called the "Crown of the continent," on account of the number of great rivers which here take their rise. Reclus, in The Earth and its Inhabitants, says:

> Union Peak [27 miles southeast of To-Gwo-Tee Pass] * * * must be regarded as the chief central point of the United States for the dispersion of its running waters to the surrounding marine basins; here is the true continental divide.

Within 25 miles of the To-Gwo-Tee Pass lie the sources of the Yellowstone, Snake, Wind, and Green (main head stream of the Colorado) rivers. The Shoshone Mountains, crossed at their southwestern angle by the military road, are thus described by Captain Jones:

> The Sierra Shoshone range is probably the most remarkable one in the great Rocky Mountain chain. The original range, if there ever was one, and of this there are many indications, lies buried beneath an outpouring of material from the fluid interior of the earth, which it is safe to estimate as being now from 4,000 to 5,000 feet

thick. * * * The peaks are all over 10,000 feet, and many reach an elevation of over 12,000 feet, and are composed entirely, so far as our observation went, of this material (except the Washakie Needles, which is granite). It will be more appropriate to speak of it as a mountain mass, which extends from latitude 43° 10′ in a northerly direction to 45° 10′, with a general width of over 60 miles in peaks that will certainly average over 10,000 feet in elevation. * * *

This mountain mass has been eroded to a remarkable extent and the streams have cut their channels into it accordingly in the most irregular manner. * * * Their valleys are simply huge canyons, except the usual park-like opening near their sources.

The mountain slopes are covered with forests of coniferous trees wherever it is possible for trees to grow, and streams are very numerous. Perhaps more water is shed from this mass of mountains than from any of equal size in the Rocky Mountain chain.

There are no roads across the Sierra Shoshone range, and this expedition is the first that ever crossed it, a feat that had been previously considered very difficult, if not impossible. (Reconnoissance in Northwestern Wyoming, 1873.)

The following description of To-Gwo-Tee Pass and the characteristics of the Shoshone Mountains is taken from the Annual Report of the United States Geological and Geographical Survey of the Territories for 1877:

The approaches to the summit of To-Gwo-Tee Pass are easy, and the spot itself is one of the most interesting, both for its geologic as also its picturesque surroundings. It is filled with open, grassy undulations, whose hollows hold pretty lakelets, the declivities dotted with beautiful groves of pine and spruce, and threaded by tiny rivulets bordered by charming little intervales, and miniature terraces bright with many-hued flowers and the white blossoms of a delicate clover. Densely wooded taluses sweep up into the mountain heights on either hand, whose lofty, precipitous walls form a majestic gateway to the pass across the great watershed.

The mountain on the south side of the pass afforded a good opportunity to gain a general knowledge of the character of the vast sedimented volcanic accumulations out of which these mountains have been sculptured. The summit of this peak rises 1,000 feet above the pass, and on all sides its slopes are steep, on the east precipitous. The above-mentioned somber volcanic breccia enters largely into the formation of the basis of the mountain, reaching more than halfway to the summit. Then succeeds several hundred feet thickness of partially exposed breccias, the steep slope covered with débris up to the shoulder, from which rises the huge angular block that crowns the summit of the mountain. The basis of this block is formed of drab breccia and incoherent or partially consolidated volcanic sands. A thickness of 20 feet of conglomerate forms the plinth.

* * * The uppermost deposit shows a thickness of above 50 feet of a brecciated mass, consisting of angular fragments of various kinds of volcanic rocks held in a fine, soft, drab-gray paste. These masses, by weather action, are wrought into many curious shapes, rent and fissured and pinnacled, with cornices and ashy sandy taluses, which give to the mural exposures, seen at a distance, the somber and light-gray banded appearance which render their recognition so certain wherever they appear.

Notwithstanding the smoky state of the atmosphere the view from this high station was of unusual interest. The opposite side of the pass is walled by far grander escarpments of the fragmental volcanics which have intimate connection with a mountain ridge extending many miles to the eastward, where it merges into that portion of this great volcanic highland belt to which Captain Jones applied the name Sierra Shoshone. This east-west ridge, itself of titanic proportions, forms the water divide between the sources of Buffalo Fork and the northern affluents of Wind River, and throughout it presents the same stupendous mountain wall. The main Wind River heads in the angle formed by this ridge and the northern extension of the Wind River range on its southwest. The latter ridge is capped for a few miles by the volcanic breccias. * * *

This whole region is one of most forbidding grandeur. The volcanic crests all rise above timber line, while their precipitous sides show the dull banded volcanic ledges almost destitute of vegetation. But the taluses are generally heavily wooded, and at the time of our visit immense columns of smoke from forest conflagrations rose high in the air, in places blotting out the view of distant mountains.

A good idea of the structure of the Shoshone Mountains is given in photograph No. 4, which shows a portion of the spur that divides the valleys of Wind River and the west branch of Long Creek. A finer view of these mountains is to be had from points on the military road where it crosses the divides between the west branch of Long Creek and the De Noir. On the east slope from To-Gwo-Tee Pass heavy timber and abundant vegetation are found as far down as the Hunters' Cabin; and the east slopes of the Wind River Mountains, as far as they could be seen from the road, are densely wooded. Proceeding down the valley from the Hunters' Cabin, the slopes on the left of Wind River show a rapidly dimishing amount of rainfall, and at Clark's the "arid" or "semiarid" region, extending to the Missouri River and beyond, has about been reached. Photographs Nos. 7 to 10 show that the road between Clark's and Fort Washakie lies in such a region.

VALUE OF THE ROAD AS PART OF A THROUGH ROUTE.

Previous to the construction of this road the Yellowstone Park could not be reached from the southeast except by the circuitous and difficult road through Union Pass. In 1881 Governor John W. Hoyt, of Wyoming, made an extended reconnaissance to discover a practicable wagon route to the Yellowstone Park from the southeast. He examined two routes, viz, via the Wind River, To-Gwo-Tee Pass, and Two-Ocean Pass, and thence down the Upper Yellowstone; and via the Stinking Water Valley to Yellowstone Lake, these two being the routes discovered by Captain Jones in 1873. He also endeavored to find a practicable crossing of the Shoshone Mountains at the head of several tributaries of the north fork of Wind River, but none was discovered. His comparison of the merits of the two routes is as follows:

> The route up the Wind River and across the divide by the To-Gwo-Tee and Two-Ocean passes to the head of the Yellowstone Lake is remarkable not only for its interesting—ofttimes captivating—scenery, but also for having an abundance of grass, timber, and pure water all the way, as well as much wild game and mountain trout. And what is yet more important, it is characterized by a very easy grade both ascending and descending the mountains. As compared with the Stinking Water route, it has the disadvantage of requiring the building of more new road inside the park as a means of connecting it with the roads and trails already made. Moreover, as this route, after it leaves the Indian reservation, lies through a section whose altitude will forbid its improvement for agricultural purposes, or even for grazing purposes the year around, the building of the proposed road on that line would not, to the same extent, aid the industrial development of the country.
>
> The route by which we returned has the advantage of running through a section already filling up with ranches for nearly a hundred miles, and has for more than that distance a wagon trail which with small outlay could be made a good road. It also has the advantage of leading almost at once, after crossing the divide, to the foot of Yellowstone Lake, where the most important improvements are likely to be placed. Nor is it wanting, along the Stinking Water, in fine scenery, timber, or good water, for the mountains are covered with forests, and the river, so outraged by its name, is a pure and beautiful stream as far down as we saw it, having its sources among the loftiest of the Sierras and being well supplied with trout. It has the disadvantage of partly lying through a section (between the Wind River and the Ishawooa) not well supplied with water at all points in the dry season, of requiring many more bridges than the Wind River route, besides a considerable amount of rock in the canyon, and, finally, of having a much less easy grade at and near the summit of the divide. (Messages and Documents, Interior Department, 1881-82.)

The disadvantage that the route via To-Gwo-Tee Pass and Two-Ocean Pass would require the building of more new road inside the park to connect with existing roads does not apply to the route via To-Gwo-Tee Pass and Jacksons Lake. In fact, as a road has already been built by the Government from the Yellowstone Lake to the south boundary of the Yellowstone Park Timber Land Reserve (designated on map accompanying Mr. Wood's report as Yellowstone Park Forest Reservation), no new road inside the park or timber-land reserve would need to be built. Governor Hoyt, in his above-quoted report, argues that as the Yellowstone Park lies principally in Wyoming the people of that State should naturally be most interested in it, and that a reasonably direct and good road by which they may reach it ought to be provided. This argument would appear to be a sound one. The above requirement as to directness is certainly fulfilled by the military road.

Other military advantages of the road besides the one spoken of in the early part of this report are the connecting of Forts Washakie and Yellowstone and of the Northern Pacific and Union Pacific railroads by a direct and fairly good road.

FURTHER REQUIREMENTS.

By Presidential proclamation dated February 22, 1897, a large area adjoining and to the south of the Yellowstone Park Timber Land Reserve was set apart as a forest reservation (designated in the proclamation as "Teton Forest Reserve") and withdrawn from future settlement. The law under which the proclamation was issued provides means by which present settlers may, if they desire, be given land elsewhere in lieu of that held by them within a forest reserve. Of the 53.8 miles of the military road 39½ miles lies within the Teton Forest Reserve. There being very few settlers at present in the upper part of Jacksons Hole (and future settlement prohibited), and only one ranch on the military road east of the forest reserve, it is evident that this road, which, as in the case of every other road, will require repairs from time to time, at least annually, to keep it in good condition, will have to be maintained by the Government. Portions of the road, moreover, are liable during the winter to be completely obstructed by falling timber. This should be removed each summer as soon as the pass is open. In view of the distance of the road from railroads and sources of supply and labor, I should estimate the annual cost of maintenance at $1,000.

Considering the whole route from Fort Washakie to the Yellowstone Park Timber Reserve, about 151 miles, it is seen by the map that about 54 miles of this distance falls within the Wind River Indian Reservation, about 58½ miles within the Teton Forest Reserve, and only about 38½ miles on land not within Government reservations. This latter section is very sparsely settled, and is completely surrounded by high mountains and the two reservations mentioned, for which reason it is not likely to become thickly settled in the near future. If, therefore, a good road between Fort Washakie and the Yellowstone Park is needed it will have to be built (or existing roads improved) and maintained by the Government throughout its whole extent. While I had no opportunity to examine the line between Clarks and Fort Washakie, and only hurriedly passed over the line of the road between the mouth of the Buffalo and the Timber Reserve, the location of which line can undoubtedly be improved, I believe that the further expenditure of $50,000 would result in a through road, as above, which would satisfy all present requirements. Roughly and from insufficient data I would divide this expenditure as follows:

Between Fort Washakie and Clark's	$25,000
Improving military road built 1898	15,000
Between mouth of Buffalo and Timber Reserve	10,000
Total	50,000

The improvement of the military road would consist in constructing a bridge over the Buffalo Fork and several smaller bridges, in improving present grades and grading at other points, in widening and

straightening the timber cutting, in draining portions of the road, and in marking distances, camping grounds, etc. The annual cost of maintenance of the through route I would estimate at $4,000.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

APPENDIX A.

REPORT OF LIEUTS. ALEX. W. PERRY AND J. A. RYAN, NINTH CAVALRY.

HEADQUARTERS DEPARTMENT OF THE PLATTE,
Camp on Buffalo Fork of Snake River, Wyoming, September 5, 1897.

SIR: In accordance with letter of instructions from the department commander, dated Fort Washakie, Wyo., August 12, 1897, the following report of the best practicable route for a wagon road over the Rocky Mountain Divide, near the head of Wind River, is hereby submitted:

Upon examination there were found near the head of Wind River three trails passing over the divide—Union Trail, Sheridans Trail, and To-Gwo-Tee Trail. Union Trail, which has also a wagon road, was examined from Clark's ranch to the mouth of Buffalo Fork, a distance of 115 miles.

Sheridans Trail was followed most of the distance, far enough for as much examination as was considered necessary.

The To-Gwo-Tee Trail was carefully examined its entire length, which from Clark's ranch to the mouth of Buffalo Fork is about 60 miles.

After reaching the summit of the pass an examination was also made of the route down Cottonwood Creek, the entire length of Elkhorn Creek was gone over, also that of Black Rock Creek and the Buffalo Fork as far up as the junction of its North and South Forks.

Beginning at Clark's ranch on the Wind River the route should follow the Sheridan Trail as far as Long Creek, which flows into Wind River from the north. Crossing Long Creek it should be ascended almost to the timber line; thence due west to the Hunters' Cabin near Wind River and close to the To-Gwo-Tee Trail, keeping well up on the bench to avoid the coulees near the river. From the Hunters' Cabin the route lies on the north side of the Wind River, which for 5 miles abounds in standing and fallen timber. There are some ravines which may be avoided by going farther to the north of the stream.

After passing through this timber the summit of the pass is reached by gentle slopes, the route being free from timber. From the summit, To-Gwo-Tee Trail down Black Rock Creek should be followed for a distance of about 10 miles, which would place the route through a succession of parks on the high land to the north of this creek. At this point on the trail there is a long swale stretching in a northwesterly direction toward Buffalo Fork and reaching it a little to the west of the mouth of Lava Creek; the route should leave the trail and pass down this incline, which is very gentle, and cross Buffalo Fork at the most suitable place; thence to foothills to the mouth of that stream, where the ground is dry and free from timber. It can be extended to the mouth of this river on the north side along the base of these hills, thus completing the route and making the entire distance about 65 miles, thus making a saving of about 50 miles over any other wagon trail between the head of Wind River and the mouth of Buffalo Fork.

The accompanying map will show approximately the proposed route.

Very respectfully, your obedient servants,

ALEX. W. PERRY,
First Lieutenant, Ninth Cavalry, Aid.
J. A. RYAN,
First Lieutenant, Ninth Cavalry.

The ADJUTANT-GENERAL,
Department of the Platte, Omaha, Nebr.

APPENDIX B.

REPORT OF MR. W. H. WOOD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Sioux City, Iowa, January 30, 1899.

CAPTAIN: I have the honor to submit the following report on the location and survey of the military wagon road between Fort Washakie and the mouth of the Buffalo Fork of Snake River:

I left Fort Yellowstone on August 15, 1898, three days in advance of the main party, with a pack train and party of five, including cook and packer. I was to push through as rapidly as possible, marking the first few miles of the road that was to begin at the mouth of the Buffalo Fork, and then to go through to Clark's ranch on Wind River, making a rough reconnoissance of the country to determine the general route of the road.

I reached the top of the big hill beyond the Buffalo ford, about 20 miles from the mouth of Buffalo, on August 23. This ascent is a steep climb, 20 per cent in places, but very little grading. At this camp we struck the pack trail over To-Gwo-Tee Pass, and I followed it all the way to Clark's. Coming back, I left the trail 2 miles from Clark's, went up Long Creek 5 miles, crossed back to Wind River at the Hunters' Cabin, where the heavy timber begins, and spent several days exploring in the heavy timber between Hunters' Cabin and the top of the pass. It was certain the road could not follow the pack trail down Wind River from the pass. Where the trail is close to the river, as it is for the first 4 miles, the ground is altogether too rough and too miry. The trail there leaves the river and climbs the mountain slope on the south side of the river, to go around the canyon of the river. The ground is very rough, and being on the north slope is very wet and boggy, almost impassable for pack animals. So I spent all my time on the north side of the river where the slopes facing south are much drier. The timber is so dense and so much of it down that traveling was very slow. I was to return and report to you on September 1. The week available between the 23d and that date was not enough to find a location for the road, but it did satisfy me that the road should be built on that side of the river.

According to programme, I returned on the 1st and found you in camp where I had camped on the 23d. On the 3d I moved east again to the top of the pass, taking six axmen with me. I set them at work near the divide and spent several days locating the road from the summit down the east slope.

During this time you had found an easier route than following the valley of the Black Rock to the summit, as I had done. Your new route brought you within 2 miles of the summit without any grading. On the 8th I connected your new line with the line I had marked over the summit. On the 11th my pack outfit was discharged and I joined the main party, now close to the summit. By the 15th I had marked the road to the big descent into Wind River, near the Hunters' Cabin. On the 15th I leveled and cross sectioned two lines down the big hill. One, the line adopted, on a 20 per cent grade, the cross slope light, so that the total grading was less than 600 cubic yards. On the other line the grade could be made much less, but the cross slope was so very steep, 5 on 7, that the amount of grading would have been much greater and the cut always sliding in.

On the 19th of September I began the survey of the road. This survey was started just east of the summit, was run east for two days, to station 89; then began at station 1 again, near the summit, and was run west to Joe Smith's ranch, to station 369; then was taken up at station 89 and run east to the end of the road and continued to the bridge over Wind River, 1 mile east of Clark's ranch. When I had brought the survey to this point you had finished the road, October 4, and started back for Fort Yellowstone. I traveled back with you, and when we reached the camp at the Buffalo ford, I took up the survey where it had ended on September 27, near Joe Smith's, and continued it to the mouth of the Buffalo, where we joined the main road up Snake River to Jacksons Lake and the park on October 8.

The survey was entirely a stadia survey. The transit had a large and delicate level under the telescope and a good vertical circle. The vertical angle was read every time the stadia rod was held up; this angle being to the same height above the ground as that at which the transit stood.

This survey has been platted on a scale of 500 feet to the inch, and the length of every course scaled from this map.

Of course an accurate measurement of the center line of the road would be a little in excess of this scaled measurement. Now, you had the whole road measured in both directions during its construction, by counting the revolutions of a wagon wheel, carefully measured. Two different wagons were used on different portions of the line—a light spring wagon and a heavy freight wagon. Any measurement duplicated by either wagon agreed very closely, but both wagons gave less than the scaled distance, as shown by table below:

Comparison of scaled distances with wagon-wheel measurement.

SPRING WAGON, WHEEL 10.11 FEET IN CIRCUMFERENCE.

	Scaled.	By wheel.	Per cent.
	Feet.	*Feet.*	
Joe Smith's to Buffalo Ford	44,700	44,382	99.29
Bridge No. 9	36,740	36,436	99.17
Bridge No. 10	14,130	14,093	99.74
Station 156	14,485	14,336	98.97
Total	110,055	109,247	99.27

FREIGHT WAGON, WHEEL 11.65 FEET IN CIRCUMFERENCE.

Station 156 to Station 1	35,880	35,084	97.78
Station 381	25,750	25,065	97.34
Station 456	23,540	22,898	97.27
Station 494	27,260	26,807	98.34
Station 556 (De Noir Creek)	29,885	29,183	97.65
Total	142,315	139,027	97.70

The basis of the elevations given on the profiles is the summit of To-Gwo-Tee Pass, as given by Capt. W. A. Jones, Corps of Engineers, in 1873. This makes our levels agree with those of the United States Geological Survey at the Buffalo ford within about 10 feet.

There were 584 instrument stations, all marked with a large stake, well driven, with the number of the station in red chalk, except from Joe Smith's to mouth of Buffalo. There were 1,967 pointings of the instrument to points on the road, with vertical angles at each, and 259 pointings to points off the road to locate topography, most of them with vertical angles.

Grading was done in 150 different stretches of all lengths, aggregating a total length of 45,735 feet, with a total quantity of material removed of 5,856 cubic yards, of which 210 linear feet and 40 cubic yards was rock and the balance earth. There were 50 pounds of dynamite used in the rock excavation.

This grading was almost entirely sidehill work, was done with plow and scrapers and with picks and shovels, and varied from a single furrow to a 14-foot cut. The only place where the top of a hill had to be taken off to reduce the grade was at the last long hill to Wind River, where the greatest cut was 14 feet.

The clearing extended over 74,540 feet, or about three-tenths of the length of new road constructed. At an average width of 22 feet this makes 37.65 acres of clearing. The width of clearing varied a good deal, being least in the live timber and greatest when the standing timber was burned and dead. The timber varied greatly, from very scattering and small timber to very dense large timber, the largest timber cut being over 2 feet in diameter and over 100 feet high. One hundred and fifty pounds of dynamite were used in blowing out stumps.

The following table gives the location, by distances from Snake River, of all bridges, with clear span and total length. The bridges were all made of round live timber, three stringers of large size, with flooring of round live timber not over 6 inches at the butt, and 14 feet long, laid alternately butt and top.

Details of bridges.

No.	Profile distance.	Span.	Total length.	No.	Profile distance.	Span.	Total length.
			Feet.				*Feet.*
1	24, 695	2	4	24	175, 285	10	14
2	33, 300	8	14	25	175, 500	2	4
3	59, 180	8	12	26	176, 230	4	6
4	77, 095	16	28	27	178. 635	10	15
5	77, 205	12	20	28	180, 515	14	18
6	78, 135	10	14	29	184, 245	22	26
7	78, 405	10	14	30	184, 380	11	15
8	80, 135	*a* 32	40	31	185, 280	4	6
9	113, 160	20	30	32	185, 425	14	18
10	127, 290	6	14	33	190. 765	3	4
11	129, 125	10	13	34	191, 820	4	7
12	129, 280	7	14	35	193, 040	12	21
13	129, 660	4½	8	36	195, 230	10	16
14	131, 800	4	7	37	195, 955	5	7
15	131, 990	9½	13	38	198, 705	14	16
16	159, 400	8	12	39	201, 475	8	12
17	159, 630	8	12	40	211, 845	20	23
18	163, 855	9	12	41	220, 685	6	8
19	164, 885	6	9	42	251, 000	6	18
20	165, 145	10	14	43	266, 670	18	23
21	165, 405	9	12	44	267, 155	10	15
22	165, 530	7	10				
23	168, 145	6	8	Total			626

a Two 16-foot spans.

The office work, done in Sioux City, consists of first reducing all stadia readings to the true horizontal distances, and finding the difference of level of every station; then plotting the road, on a scale of 500 feet to 1 inch, on four large sheets, each about 8 feet long. From this plotting the length of every course, between stadia readings, was scaled, and a continuous table of "profile distances" was made up, with the elevation of every reading opposite its distance. From this table a profile, on a horizontal scale of 200 feet to 1 inch and a vertical scale of 40 feet to 1 inch, was made. On this profile all grading is shown, with the area of the excavation given at numerous points, and the total quantity in each cut. The length of every separate piece of clearing is also shown. From this large scale map and profile another map and profile was made to a horizontal scale of 5,000 feet to 1 inch and vertical scale of 1,000 feet to 1 inch. On this map the topography from the United States Geological and Land surveys was shown. Three tracings of this map and profile have been made, and triplicate tracings of small drawings.

Very respectfully,

W. H. Wood,
Assistant Engineer.

Capt. J. C. Sanford,
Corps of Engineers, U. S. A.

Money statement.

Amount appropriated by act of June 4, 1897		$10, 000. 00
Amount expended by Quartermaster's Department to July 21, 1898	$109. 25	
Amount expended by Engineer Department to February 2, 1899	9, 720. 20	
		9, 829. 45
February 3, 1899, balance unexpended		170. 55
February 3, 1899, outstanding liabilities (estimated)		170. 55

LAWS

AFFECTING

THE CORPS OF ENGINEERS,

UNITED STATES ARMY,

FIFTY-FIFTH CONGRESS, THIRD SESSION.

1898-1899.

8901

LAWS

AFFECTING

THE CORPS OF ENGINEERS, UNITED STATES ARMY.

FIFTY-FIFTH CONGRESS, THIRD SESSION, 1898-1899.

PUBLIC ACTS.

January 5, 1899.

CHAP. 41.—An Act Making appropriations to supply urgent deficiencies in the appropriations for the support of the military and naval establishments for the last six months of the fiscal year ending June thirtieth, eighteen hundred and ninety-nine, and for other purposes.

Deficiencies appropriations for Army, etc.

Laws 2d sess. 55th Cong., pp. 390, 437, 696.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That out of the balances remaining unexpended January first, eighteen hundred and ninety-nine, of the appropriations made by the deficiency appropriation Acts approved May fourth and June eighth, eighteen hundred and ninety-eight, respectively, and by section two of the deficiency appropriation Act approved July seventh, eighteen hundred and ninety-eight, for the six months beginning July first, eighteen hundred and ninety-eight, on account of war expenses under the titles "War Department," and "Military establishment," there is hereby reappropriated and made available for expenditure during the six months beginning January first, eighteen hundred and ninety-nine, for objects hereinafter specified, the following sums, namely:

* * * * *

MILITARY ESTABLISHMENT.

Army.

* * * * *

ENGINEER DEPARTMENT.

Engineer Department.

Tools, etc.

For pontoon trains, intrenching tools, instruments, and drawing materials, thirty thousand dollars.

Employees.

For services of surveyors, draftsmen, photographers, and clerks to engineer officers on the staff of division and corps commanders, thirty thousand dollars.

* * * * *

National defense.

NATIONAL DEFENSE.

Reappropriation. Laws 2d sess. 55th Cong., p. 274.

That the balance remaining unexpended January first, eighteen hundred and ninety-nine, of the appropriation of fifty million dollars for the national defense, and for each and every purpose connected therewith, to be expended at the discretion of the President, and to remain available until January first, eighteen hundred and ninety-nine, made by the Act approved March ninth, eighteen hundred and ninety-eight, is hereby reappropriated and made available for expenditure for the same purposes during the six months beginning January first, eighteen hundred and ninety-nine.

The following sums are hereby appropriated out of any money in the Treasury not otherwise appropriated:

Missouri River.

MISSOURI RIVER.

Improvement of Pelican Bend.

Deduction. Vol. 29, p. 231.

For continuing and completing the work of protecting the bank in Pelican Bend, Missouri River, one hundred thousand dollars. And this sum shall be deducted from the sum of three hundred thousand dollars authorized to be appropriated and expended for continuing improvement of the Missouri River from its mouth to Sioux City, Iowa, for the fiscal year ending June thirtieth, nineteen hundred, by the "Act making appropriations for the construction, repair and preservation of certain public works on rivers and harbors, and for other purposes," which became a law on June third, eighteen hundred and ninety-six.

* * * * *

Approved, January 5, 1899.

January 10, 1899.

CHAP. 42.—An Act To authorize the Choctaw and Memphis Railroad Company to construct bridges across the Arkansas and other navigable rivers in the State of Arkansas.

Choctaw and Memphis Railroad may bridge Arkansas River, etc.

Transit of vehicles, etc.

Tolls.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Choctaw and Memphis Railroad Company, a corporation created and existing by virtue of the law of the State of Arkansas, its successors and assigns, be, and is hereby, authorized to construct and maintain bridges across the Arkansas River and such other navigable rivers in the State of Arkansas as may be necessary for the crossing of said rivers with its railroad line at such points as may be selected by the said railroad company and approved by the Secretary of War. Said bridges shall be constructed to provide for the passage of railroad trains, and, at the option of said railroad company by which they may be built, may be used for the passage of wagons and vehicles of all kinds, for the transit of animals, and for foot passengers, for such reasonable rates of toll as may be fixed by the said railroad company and approved by the Secretary of War.

To be lawful structures and post routes.

SEC. 2. That any bridges built under this Act and subject to its limitations shall be lawful structures, and shall be recognized and known as post routes; and they shall enjoy the same rights and privileges as other post roads in the United States; and equal privileges in the use of said bridges shall be granted to all telegraph and telephone companies; and the United States shall have the right of way across said bridges and their approaches for postal telegraph purposes.

Telegraph and telephone.

SEC. 3. That all railroad companies desiring the use of said bridges shall have and be entitled to equal rights and privileges relative to the passage of railway trains over the same and over the approaches thereto, upon the payment of a reasonable compensation for such use; and in case the owner or owners of said bridges and the several railroad companies, or any of them desiring such use, shall fail to agree upon the sum or sums to be paid, and upon the rules and conditions to which each shall conform in using said bridges, all matters at issue between them shall be decided by the Secretary of War, upon a hearing of the allegations and proofs of the parties.

Railroads.
—equal rights to use.
—disagreements of, with owner of bridges.

SEC. 4. That all bridges authorized to be constructed under this Act shall be built under and subject to such regulations for the security of the navigation of the rivers over which they may be built as the Secretary of War shall prescribe, and to secure that object the said company or corporation shall submit to the Secretary of War for his examination and approval designs and drawings of the bridges and maps of locations selected; and until the said plans and locations are approved by the Secretary of War the bridges shall not be commenced or built; and should any changes be made in the plans of said bridges, or any one of them, during the progress of construction, such changes shall be subject to the approval of the Secretary of War, and all changes in said bridges, or any one of them, required by the Secretary of War at any time, or their entire removal, shall be at the expense of the corporations or persons owning or operating said bridges.

Secretary of War to approve plans, etc.
—changes.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

SEC. 6. That this Act shall be null and void if actual construction of the bridges herein authorized is not commenced within one year and completed within three years from the date thereof.

Commencement and completion.

Approved, January 10, 1899.

CHAP. 43.—An Act To amend an Act entitled "An Act to authorize the Oregon and Washington Bridge Company to construct and maintain a bridge across the Columbia River, between the State of Oregon and the State of Washington, and to establish it as a post road."

January 10, 1899.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That "An Act to authorize the Oregon and Washington Bridge Company to construct and maintain a bridge across the Columbia River, between the State of Oregon and the State of Washington, and to establish it as a post road,"

Time extended for Oregon and Washington Bridge Co. to bridge Columbia River.
Vol. 26, p. 28.

approved March twenty-fourth, eighteen hundred and ninety, be, and the same is hereby, extended, revived, and declared to be in full force and effect from and after March twenty-fourth, eighteen hundred and ninety-two. Section twelve of said Act, which provides that said Act shall be null and void if actual construction of the bridge therein authorized be not commenced within two years and completed within four years from the date of the approval thereof, shall be, and the same is hereby, so amended that the time within which said bridge is required to be commenced shall be within one year and the time within which it is required that said bridge be completed shall be within three years from the date of approval of this Act.

Approved, January 10, 1899.

January 12, 1899.

CHAP. 48.—An Act To provide for the establishment of building lines on certain streets in the District of Columbia, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Commissioners of the District of Columbia are hereby authorized to establish building lines on streets or parts of streets less than ninety feet wide in the District of Columbia,

District of Columbia.
Building lines on streets less than ninety feet wide, how established.

* * * * *

Projecting buildings may remain, etc.

SEC. 5. That the said Commissioners, whenever they deem it desirable in the interest of economy, may permit buildings existing at the time said building lines are established, and which project beyond said lines, to remain until such time as the owners of said buildings desire to reconstruct or substantially alter the said buildings: *Provided*, That the Act of Congress approved March third, eighteen hundred and ninety-one, providing for certain projections upon street parkings, shall apply to all parkings established under this Act, and the control of said parkings otherwise shall be vested in the Commissioners of the District of Columbia, who are hereby authorized to make and enforce all reasonable and necessary regulations for their care and preservation.

Proviso.
Street parkings projections; control, etc.
Vol. 26, p. 868.

Approved, January 12, 1899.

January 28, 1899.

CHAP. 64.—An Act To authorize the construction of a bridge across the Missouri River at or near Oacoma, South Dakota.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Chicago, Sioux Falls and Pacific Railway Company, a corporation duly created and existing under the laws of the State of South Dakota, its successors or assigns, be, and they are hereby, authorized to construct and maintain a bridge and approaches thereto over the Missouri River

Chicago, Sioux Falls and Pacific Railway may bridge Missouri River.

from a point at or near the village of Oacoma, in the county of Lyman and State of South Dakota, to the opposite shore of said river, in the county of Brule and State of South Dakota: *Provided*, That a location is found within such limits suitable to the interests of navigation. Said bridge shall be constructed to provide for the passage of railway trains, and, at the option of said corporation, its successors or assigns, may be so constructed to provide for and be used also for the passage of wagons and vehicles of all kinds, for the transit of animals, and for foot passengers, for reasonable rates of toll, to be fixed by said corporation, its successors or assigns, and approved by the Secretary of War, and the Secretary of War shall have the right from time to time to revise such rates of toll: *Provided*, That the bridge herein authorized to be constructed shall not be built within less than one mile of any other bridge across the said Missouri River.

Provisos. Location. Transit of railway trains, etc.

Tolls.

Proximity to other bridges.

SEC. 2. That any bridge built under the provisions of this Act may, at the option of the corporation building the same, be built as a drawbridge or with unbroken or continuous spans: *Provided*, That if the same shall be made of unbroken continuous spans it shall not be in any case of less elevation than fifty feet above extreme high-water mark, as understood at the point of location, to the lowest part of the superstructure; nor shall the spans of said bridge be less than three hundred feet in the clear at low-water mark, and the piers of said bridge shall be parallel with the current of the river at high water, and the main spans shall be over the main channels of the river: *And provided also*, That if a bridge shall be built under this Act as a drawbridge the same shall be constructed as a pivot drawbridge, with one or more draws, as the Secretary of War may prescribe, and with spans of not less than two hundred feet in length in the clear on each side of the central or pivot piers of the draws, and the next adjoining spans over the river to the draws shall not be less than two hundred and fifty feet in the clear, measured at low water; and said spans shall not be less than ten feet above extreme high-water mark, measuring to the lowest part of the superstructure of the bridge; and the piers of said bridge shall be parallel with the current of the river at high water: *And provided also*, That said draw shall be opened promptly, upon reasonable signal, without unnecessary delay; and said company or corporation shall maintain, at its own expense, from sunset till sunrise, such lights or other signals on said bridge as the Light-House Board shall prescribe, and such sheer booms or other structures as may be necessary to safely guide vessels, rafts, or other water craft safely through said channel spans or draw openings, and as shall be designated and required by the Secretary of War: *And provided further*, That the corporation building said bridge may, subject to the approval of the Secretary of War, enter upon the banks of said river, either above or below the point of location of said bridge, and confine the flow of the water to a permanent channel, and do whatever may be necessary to

May be drawbridge or spans.

Provisos. —height, if spans, etc.

—pivot drawbridge, etc.

Opening draw.

Lights.

Making permanent channel; limitation.

accomplish said object, but shall not impede or obstruct the navigation of said river, and shall be liable in damages for all injuries to private property; and all plans for such works or erections upon the banks of the river shall first be submitted to the Secretary of War for his approval: *And provided further*, That any bridge built under the provisions of this Act shall be at right angles to the current of the river at high water.

Position of bridge.

Not to obstruct navigation.

SEC. 3. That no bridge shall be erected or maintained under the authority of this Act which shall at any time substantially or materially obstruct the free navigation of said river; and no bridge shall be commenced or built under this Act until the location thereof and the plans and specifications for its construction shall have been submitted to and approved by the Secretary of War; and any change in the plan of such construction or any alteration in the bridge after its construction shall be subject to the like approval; and whenever said bridge shall, in the opinion of the Secretary of War, substantially obstruct the free navigation of said river he is hereby authorized to cause such change or alteration of said bridge to be made as will effectually obviate such obstruction; and all such alterations shall be made and all such obstructions be removed at the expense of the owner or owners of said bridge or the persons operating or controlling the same; and in case of any litigation arising from any obstruction or alleged obstruction to the free navigation of the Missouri River at or near the crossing of said bridge, caused or alleged to be caused thereby, the cause shall be commenced and tried in the circuit courts of the United States of either judicial district of South Dakota in which the said bridge or any portion of such obstruction touches. And the bridge shall not be opened to traffic until all piling and other false work used in constructing the bridge shall have been wholly removed to the satisfaction of the Secretary of War.

Secretary of War to approve plans.

—changes.

Litigation.

Removal of piling, etc.

To be lawful structure and post route.

SEC. 4. That any bridge built under this Act and according to its limitations shall be a lawful structure, and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transportation over the same of the mails, the troops, and munitions of war of the United States than the rate per mile paid for their transportation over the railroad or public highways leading to such bridge. The United States shall also have the right to construct, without charge therefor, telegraph or telephone lines across said bridge.

Telephone and telegraph lines.

Amendment.

SEC. 5. That Congress may at any time alter, amend or repeal this Act.

Commencement and completion.

SEC. 6. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within two years and completed within four years from the date hereof.

Approved, January 28, 1899.

February 2, 1899.

CHAP. 82.—An Act To authorize the construction of a bridge across the Savannah River from the mainland of Chatham County, Georgia, to Hutchinsons Island, in said county.

Georgia and Alabama Railway may bridge Savannah River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent of the United States of America is hereby given to the Georgia and Alabama Railway, a corporation incorporated by the laws of the State of Georgia, its successors and assigns, and such other persons as may be associated with it, to construct and maintain a bridge over the Savannah River from the mainland to Hutchinsons Island, in the county of Chatham, in the State of Georgia.

Aids to navigation.

Secretary of War to prescribe regulations.

—to approve plans.

—changes.

Draw.

Lights.

Alterations to secure free navigation.

SEC. 2. That the bridge shall be so constructed, by draw span or otherwise, that a free and unobstructed passage may be secured to all vessels and other water craft navigating said river. That any bridge constructed under this Act shall be built and located under and subject to such regulations for the security of the navigation of said river as the Secretary of War shall prescribe; and to secure that object the said company shall submit to the Secretary of War, for his examination and approval, the design and drawings of the bridge, piers, and approaches, and a map of the location, giving, for the space of at least one mile above and one mile below the proposed location, the topography of the banks of the river, the shore lines at high water and low water, and the direction and strength of the currents at all stages, and the soundings, accurately showing the bed of the stream, and the location of other bridge or bridges, wharves, landings, or ferries, and shall furnish such other information as shall be required for a full and satisfactory understanding of the subject; and until said plan and location of the bridge are approved by the Secretary of War the bridge shall not be commenced or built, and after such approval by the Secretary of War the approved plans and designs for the bridge shall not be deviated from or added to, either during the construction or after the completion of the bridge, until the proposed change shall have been submitted to the Secretary of War and received his approval; and the said bridge shall be at all times so kept and managed as to offer reasonable and proper means for the passage of vessels through or under said bridge, and if said bridge be built with a draw said draw shall be opened promptly upon reasonable signal for the passage of boats or other craft, and whatever kind of bridge is built the said company or corporation shall maintain, at its own expense, from sunset to sunrise, such lights or other signals thereon as the Light-House Board shall prescribe; and if at any time the navigation of said river shall in any manner be obstructed or impaired by the bridge authorized by this Act to be constructed the Secretary of War shall have authority, and it shall be his duty, to require said company to alter and change said bridge at its own expense in such manner as may be proper to secure free and complete navigation without impediment.

Lawful structure and post route.

SEC. 3. That any bridge built under this Act and subject to its limitations shall be a lawful structure and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transmission over the same of the mails, the troops, and munitions of war of the United States, or passengers or freight over said bridge, than the rate per mile paid for the transportation over the railroads or public highways leading to said bridge, and it shall enjoy the rights and privileges of other post roads of the United States; and equal privileges in the use of said bridge shall be granted to all telegraph and telephone companies, and the United States shall have the right of way across said bridge and its approaches for said postal-telegraph purposes.

Telegraph and telephone companies.

Rights of railroads to use.

SEC. 4. That all railroad companies desiring the use of said bridge and its approaches shall have and be entitled to equal rights and privileges relative to the passage of trains over the same upon payment of a reasonable compensation for such use; and in case the owner or owners of said bridge and the several railroad companies, or any of them, desiring such use shall fail to agree upon the sum or sums to be paid, or upon rules and conditions to which each shall conform in using said bridge and approaches, all matters at issue between them shall be decided by the Secretary of War upon a hearing of the allegations and proofs of the parties.

—disagreement of with owner of bridge.

Commencement and completion.

SEC. 5. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within one year and completed within three years from the date hereof.

Amendment.

SEC. 6. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 2, 1899.

February 4, 1899.

CHAP. 87.—An Act To authorize the construction of certain bridges over the waters of Lake Champlain.

Rutland-Canadian Railroad may bridge Lake Champlain.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Rutland-Canadian Railroad Company, a corporation created by and existing under the laws of the State of Vermont, its successors and assigns, be, and they are hereby, authorized and empowered to erect, establish, maintain, and use railroad bridges and approaches thereto in and across Lake Champlain at such places, hereinafter provided, as may be selected by said parties, and approved by the Secretary of War, to wit: A bridge and its approaches between the town of Colchester, in the county of Chittenden and State of Vermont, and the town of South Hero, in the county of Grand Isle and State of Vermont; also a bridge and its approaches between the towns of Grand Isle and North Hero, in said county of Grand Isle; also a bridge and its approaches between the towns of North Hero and Alburg, in said county of Grand Isle; also a bridge and its approaches between said town of Alburg and the town of Champlain, in the county of Clinton, in the State of New York; and also an embankment across the head of Keelers

Location of bridges.

Bay, so called, in said Lake Champlain, upon the easterly side of said town of South Hero.

Aids to navigation. Litigation.

SEC. 2. That each of said bridges shall be provided with a draw suitable to accommodate the navigation on Lake Champlain, and shall be built in such manner as not to interfere with the free navigation of said lake; and in case of any litigation arising from any obstruction or alleged obstruction to the free navigation of said lake the cause may be tried before the circuit court of the United States in and for any district in which the portion of the structure causing or alleged to cause such obstruction is situated.

Lawful structures and post routes.

SEC. 3. That all the bridges, approaches, or embankments constructed under this Act and according to the conditions and provisions hereof shall be lawful structures, and shall be known and recognized as post routes, and the same are hereby declared to be post routes, upon which, also, no higher charge shall be made for the transmission over the same of the mails, the troops, and the munitions of war of the United States than the rate per mile paid for the transportation over the railroads leading to said bridges; and they shall enjoy the same rights and privileges as other post routes in the United States.

Secretary of War to approve plans, etc. —changes.

SEC. 4. That the structures herein authorized shall be built under and subject to such regulations for the security of navigation on said lake as the Secretary of War may prescribe; and to secure that object said company shall submit to the Secretary of War for his examination and approval general designs and drawings of said bridges and embankments and a map of their location, giving, for the space of one mile above and one mile below the proposed location, the topography of the banks of the lake, the direction of the current, the soundings showing the bed of the lake, and the location of any bridge or bridges or other structures within such distance, and shall furnish such other information as may be required for a full and satisfactory understanding of the subject; and until such plans are approved by the Secretary of War the construction of the bridges and embankments shall not be commenced, and if any change is made in the plan of any of said structures during the progress of construction or after completion such change shall be subject to the approval of the Secretary of War, and be made at the expense of the owners of said structure.

Draws. Lights. Toll. *Proviso.* —approval.

SEC. 5. That the draws of said bridges shall be opened upon reasonable signal, for the passage of boats; and such lights or other signals shall, at the expense of said company, its successors and assigns, be maintained on all of said structures, from sunset to sunrise, as the Light-House Board shall prescribe, and said company, its successors and assigns, may establish reasonable rates of toll for transportation of persons and property over said structures: *Provided*, That such rates of toll shall be subject to the approval of the Secretary of War.

Commencement and completion.

SEC. 6. That this Act shall be null an void, except as to structures completed, if actual construction of the bridges herein authorized be not commenced within two years and completed within four years from the passage of this Act.

Amendment.

SEC. 7. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 4, 1899.

February 8, 1899.

CHAP. 120.—An Act To revive, reenact, and amend an Act to authorize the construction of a bridge across the Missouri River at or near the city of Lexington, Missouri.

Lexington Bridge and Terminal Company may bridge Missouri River at Lexington.
Chap. 162, vol. 28, p. 120, reenacted, etc.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act approved July twenty-sixth, eighteen hundred and ninety-four, entitled "An Act to authorize the construction of a bridge across the Missouri River at or near the city of Lexington, Missouri," which Act has expired by limitation, be, and is hereby, revived, reenacted, and amended.

That section one of said Act be amended so as to read as follows:

Railway, wagon, and foot bridge.
Toll.
Suspension bridge.

"That the Lexington Bridge and Terminal Company, a corporation existing under the laws of the State of Missouri, its assigns, grantees, successors, and legal representatives, be, and are hereby, authorized to build, own, operate, and maintain a bridge and approaches thereto over the Missouri River at or near the city of Lexington, in said State of Missouri. Said bridge shall be constructed to provide for the passage of wagons, carriages, vehicles of all kinds, for the transit of animals, horsemen, and foot passengers. And authority is hereby given to said company and assigns, at its option, to construct said bridge so as to provide for the passage of railway cars and trains propelled by electricity or steam, such reasonable rates of toll to be charged as may be approved from time to time by the Secretary of War. Said corporation and its assigns may build a suspension bridge, at their option, under the authority hereby granted."

Lawful structure and post route.
Postal telegraph.

SEC. 2. That any bridge constructed under this Act and according to its limitations shall be a lawful structure and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transmission over the same of mails, the troops, and the munitions of war of the United States than the rate per mile paid for their transportation over the railroads or public highways leading to said bridge; and the United States shall have the right of way for postal-telegraph and telephone purposes across said bridge.

Construction.
Proviso.
Aids to navigation.

SEC. 3. That said bridge shall be made with unbroken and continuous spans, and shall not be of less elevation in any case than fifty feet above high-water mark, as understood at the point of location, to the lowest member of the bridge superstructure, nor shall the spans of said bridge over the waterways of said river be less than four hundred feet in length in the clear, and the piers of said bridge shall be parallel with the current of said river and the bridge itself at right angles thereto: *Provided*, That in case the approach and passage under the channel span of said bridge be found at any time dangerous or difficult of access by the river traffic the owners of said bridge shall construct, at their own expense, such works of channel regulation and such aids to navigation as the Secretary of War shall order, to render the approach and passage reasonably safe and easy: *Provided also*, That said company or corporation shall maintain at its own expense, from sunset to sunrise, such lights or other signals on said bridge as the Light-House Board shall prescribe.

Lights, etc.

Section four shall be amended so as to read as follows:

"SEC. 4. That if said bridge shall be constructed for railroad purposes, then all railroad companies desiring the use of said bridge shall have and be entitled to equal rights and privileges relative to the passage of railway trains over the same, and over the approaches thereto, upon payment of a reasonable compensation for its use; and in case the owner or owners of said bridge and the several railroad companies, or any of them, desiring such use shall fail to agree upon the sum or sums to be paid and to rules and conditions to which each shall conform in using such bridge, all matters at issue between them shall be decided by the Secretary of War upon a hearing of the allegations and the proof of the parties."

Railroad companies' right to use.

—disagreement of, with owner of bridge.

Section five shall be amended so as to read as follows:

"SEC. 5. That any bridge authorized to be constructed under this Act shall be built and located under and subject to such regulations for the security of navigation of said river as the Secretary of War shall prescribe; and to secure that object the company or corporation shall submit to the Secretary of War, for his examination and approval, a design and drawing of the bridge and a map of the location, giving, for the space of one mile above and one mile below the proposed location, the topography of the banks of the river, the shore lines at high and low water, the direction and strength of the current at all stages, and the soundings, accurately showing the bed of the stream, the location of any other bridge or bridges, and shall furnish such other information as shall be required for a full and satisfactory understanding of the subject; and until the said plan and location of the bridge are approved by the Secretary of War the bridge shall not be built; and should any change be made in the plan of said bridge during the progress of construction, such change shall be subject to the approval of the Secretary of War; and if said bridge is not commenced within two years and completed within three years from the passage of this Act the rights and privileges hereby granted shall be null and void."

Secretary of War to approve plans, etc.

—changes.

Commencement and completion.

SEC. 6. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, February 8, 1899.

February 9, 1899.

CHAP. 127.—An Act To extend the time for the construction of a bridge across the Missouri River at or near the city of Boonville, Missouri, by the Boonville and Howard County Bridge Company.

Time extended to Boonville and Howard County Bridge Co. to bridge Missouri River at Boonville, Mo.
Vol. 29, p. 139.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section eight of the Act of May twenty-fifth, eighteen hundred and ninety-six, received by the President May thirteenth, entitled "An Act to authorize the construction of a bridge across the Missouri River at or near the city of Boonville, Missouri," be, and the same is hereby, amended so as to permit the construction of said bridge to be commenced within one year from May twenty-fifth, eighteen hundred and ninety-nine, and the completion thereof within three years from the same date.

Approved, February 9, 1899.

February 21, 1899.

CHAP. 174.—An Act To amend an Act entitled "An Act authorizing the Aransas Harbor Terminal Railway Company to construct a bridge across the Corpus Christi Channel, known as the Morris and Cummings Ship Channel, in Aransas County, Texas."

Time extended to Aransas Harbor Terminal Railway to bridge Corpus Christi Channel, Texas.
Vol. 29, p. 111.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act authorizing the Aransas Harbor Terminal Railway Company to construct a bridge across the Corpus Christi Channel, known as the Morris and Cummings Ship Channel, in Aransas County, Texas," approved May fourth, eighteen hundred and ninety-six, is hereby reenacted; and section five of the said Act is hereby amended to read as follows:

"SEC. 5. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within one year and completed within three years from May fourth, eighteen hundred and ninety-nine."

Approved, February 21, 1899.

February 21, 1899.

CHAP. 176.—An Act To establish a national military park to commemorate the campaign, seige, and defense of Vicksburg.

National Military Park, Vicksburg, Miss., established.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to commemorate the campaign and seige and defense of Vicksburg, and to preserve the history of the battles and operations of the seige and defense on the ground where they were fought and were carried on, the battlefield of Vicksburg, in the State of Mississippi, is hereby declared to be a national military park whenever the title to the same shall have been acquired by the United States and the usual jurisdiction over the lands and roads of the same shall have been granted to the United States by the State of Mississippi; * * *

SEC. 2. * * * and when title is procured to all of the lands and roads within the boundaries of the proposed park, as described in section one of this Act, he may proceed with the establishment of the park; and he shall detail an officer of the Engineer Corps of the Army to assist the commissioners in establishing the park.

* * * * *

Approved, February 21, 1899.

CHAP. 179.—An Act For a roadway in the District of Columbia from Brightwood avenue across Rock Creek Park.

February 21, 1899.

District of Columbia.
Preamble.

Whereas by reason of the projecting of the northern angle of the District of Columbia into Montgomery County, Maryland, and further, the existence of the Rock Creek Park in that part of the District, causing three different jurisdictions to join there; and

Whereas about four square miles south of said angle in the District of Columbia and a similar amount of territory about said angle in Maryland (total, eight square miles) are without internal roads or facilities for cross travel, greatly to the inconvenience of a considerable number of persons within both the District of Columbia and Montgomery County, Maryland, and which can only be relieved by concurrent action of the District of Columbia and by said county; and further, to give an entrance into the upper and larger part of the Rock Creek Park available to the public from two lines of electric cars: Therefore,

Construction of roadway authorized from Brightwood avenue across Rock Creek Park.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a roadway be, and the same is hereby, authorized to be constructed in the District of Columbia from the upper or northern extremity of Brightwood avenue westwardly toward Rock Creek, across Rock Creek Park, with such bridge and approaches as may be necessary, and from the southern or western side of said park to the upper or northeastern bend of the Daniels road, the portion of said roadway outside of said park to be constructed by or under the authority of the Commissioners of the District of Columbia and the portion of the same within said park to be constructed by or under the authority of the board of control of the Rock Creek Park.

Branches.

And further, that one branch may be constructed by said Commissioners from said main roadway, at a point to be selected by the said Commissioners north of Rock Creek, running northwesterly to the District line and to connect with a road or roads in Montgomery County, Maryland, connecting the neighborhood of Linden and Forest Glen, Maryland, with the said roadway; and further, that another branch, starting at a point south of Rock Creek, to be selected by the said Commissioners, and running west or westwardly, may be constructed to the District line to connect with a road or roads leading from the direction of Chevy Chase, Maryland: *Provided*, That said Commissioners may construct any portion of said roadway or of either or both of said branches only upon the donation of the

Proviso.
Donation of ground.

ground necessary for said roadway and branch or branches to the United States by the present owners in such manner as may be satisfactory to the said Commissioners; that the said roadway commencing at the upper end of Brightwood avenue shall be laid off and constructed more particularly as follows, by or under the authority of the said Commissioners:

Location.

Commencing at a point on Brightwood avenue on the line between the land of Van Riswick's heirs and Lee and running upon and with said dividing line westwardly on the street, or a portion of the street, laid out on the street-extension plan of section one to about where said line or street crosses a tributary of Rock Creek known as Silver Spring Branch; from that point on or with the street immediately north of Rock Creek Park, as shown by said plan, westwardly through the land of the Van Riswick heirs to or about a point one thousand feet from the District and Maryland boundary line; thence, by or under the authority of the board of control of Rock Creek Park, south and west across Rock Creek and through Rock Creek Park to the land of Mrs. Alida Catherine Brown, following the easiest and most available grade; and thence, by or under the authority of said Commissioners, through the land of Mrs. Brown in a southwest direction to the northeastern bend of the Daniels road, and with power and discretion in the said Commissioners and board of control to alter or vary the line of said roadway as may seem to them advantageous, with a view to public convenience and economy of construction. That the board of control of the Rock Creek Park be, and it is hereby, authorized to construct a roadway across said park, to connect with the roadway hereinbefore provided for, and a bridge over Rock Creek, with the necessary approaches; and that the sum of sixteen thousand five hundred dollars is hereby appropriated, one-half out of any money in the Treasury not otherwise appropriated and the other half out of the revenues of the District of Columbia, ten thousand five hundred dollars thereof to be expended by the said Commissioners, or under their authority, for the construction of the said roadway and culverts and branch or the branches hereinbefore provided for outside of said park and six thousand dollars thereof to be expended by said board of control, or under its authority, for the construction of the portion of said roadway, bridge, and approaches within said park.

Roadway across Rock Creek Park; bridge, etc.

Appropriation

Approved, February 21, 1899.

February 24, 1899.

CHAP. 187.—An Act Making appropriations for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred, and for other purposes.

Legislative, executive, and judicial expenses appropriations.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated, out of any money in the Treasury not otherwise appropri-

ll compensation for the service of the fiscal year
thirtieth, nineteen hundred, for the objects
pressed, namely:

* * * *

War Department.

R DEPARTMENT.

* * * *

Engineer Office.

IEF OF ENGINEERS: For chief
dollars; four clerks of class four; two
ree; two clerks of class two; three clerks
, one clerk, one thousand dollars; one assist-
enger, and two laborers; in all, twenty-one thou-
eight hundred and forty dollars.

Skilled draftsmen.

And the services of skilled draftsmen, civil engineers, and such other services as the Secretary of War may deem necessary may be employed in the office of the Chief of Engineers to carry into effect the various appropriations for rivers and harbors, fortifications, and surveys to be paid from such appropriations: *Provided*, That the expenditures on this account for the fiscal year ending June thirtieth, nineteen hundred, shall not exceed seventy-two thousand dollars; and that the Secretary of War shall each year, in the annual estimates, report to Congress the number of persons so employed and the amount paid to each.

Proviso. Limit of expenditure.

* * * * *

Public buildings and grounds.

PUBLIC BUILDINGS AND GROUNDS.

Clerk, messenger, etc.

OFFICE OF PUBLIC BUILDINGS AND GROUNDS: For one clerk, one thousand six hundred dollars; one surveyor and draftsman, one thousand five hundred dollars; one messenger; landscape gardener, two thousand dollars; in all, five thousand nine hundred and forty dollars.

Overseers, etc.

For overseers, draftsmen, foremen, gardeners, mechanics, and laborers employed in the public grounds, twenty-eight thousand dollars.

Watchmen.

For day watchmen as follows: One in Franklin Park; one in Lafayette Park; two in Smithsonian Grounds; one in Judiciary Park; one in Lincoln Park and adjacent reservations; one at Iowa Circle; one at Thomas Circle and neighboring reservations; one at Washington Circle and neighboring reservations; one at Dupont Circle and neighboring reservations; one at McPherson and Farragut parks; one at Stanton Park and neighboring reservations; two at Henry and Seaton parks and reservations east of Botanic Garden; one at Mount Vernon Park and adjacent reservations; one for the greenhouses and nursery; one at grounds south of Executive Mansion; one at Garfield Park; eighteen in all, at six hundred and sixty dollars each, eleven thousand eight hundred and eighty dollars.

For night watchmen as follows: Two in Smithsonian Grounds; one in Judiciary Park; one in Henry and Seaton parks and reservations east of Botanic Garden; and one in Garfield Park; five in all, at seven hundred and twenty dollars each, three thousand six hundred dollars.

Wakefield, Va.

For watchman for the care of the monument and dock at Wakefield, Virginia, the birthplace of Washington, three hundred dollars.

Contingent expenses.

For contingent and incidental expenses, five hundred dollars.

* * * * *

Appropriations not available for incapacitated employees.

SEC. 4. That the appropriations herein made for the officers, clerks, and persons employed in the public service shall not be available for the compensation of any persons permanently incapacitated for performing such service. The establishment of a civil pension roll or an honorable service roll, or the exemption of any of the officers, clerks, and persons in the public service from the existing laws respecting employment in such service, is hereby prohibited: *Provided*, That the thirty days' annual leave of absence with pay in any one year to clerks and employees in the several Executive Departments authorized by existing laws shall be exclusive of Sundays and legal holidays.

Proviso. Thirty days' leave of absence to be exclusive of Sundays, etc.

Repeal.

SEC. 5. That all laws or parts of laws inconsistent with this Act are repealed.

Approved, February 24, 1899.

February 27, 1899.

CHAP. 206.—An Act To authorize the Saint Louis, Siloam and Southern Railroad Company, of Missouri and Arkansas, to construct a bridge across White River in the State of Arkansas.

St. Louis, Siloam and Southern Railroad may bridge White River, Arkansas.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Saint Louis, Siloam and Southern Railroad Company, of Missouri and Arkansas, a corporation created and existing by virtue of the law of the State of Arkansas, its successors and assigns, be, and is hereby, authorized to construct and maintain a bridge across White River in the State of Arkansas for the crossing of said river with its railroad line at such point as may be selected by the said railroad company and approved by the Secretary of War. Said bridge shall be constructed to provide for the passage of railroad trains, and, at the option of said railroad company, may be used for the passage of wagons and vehicles of all kinds, for the transit of animals, and for foot passengers, for such reasonable rates of toll as may be fixed by the said railroad company and approved by the Secretary of War.

May be railroad, etc., bridge.

Toll.

To be lawful structure and post route.

SEC. 2. That any bridge built under this Act and subject to its limitations shall be a lawful structure, and shall be recognized and known as a post route; and shall enjoy the same rights and privileges as other post roads in the United States; and equal privileges in the use of said bridge shall be granted to all telegraph and telephone companies; and the United States shall have the right of way across said bridge and its approaches for postal telegraph purposes.

Telegraph, etc., companies.

Rights of railroads to use.

SEC. 3. That all railroad companies desiring the use of said bridge shall have and be entitled to equal rights and privileges relative to the passage of railway trains over the same and over the approaches thereto, and upon the payment of a reasonable compensation for such use; and in case the owner or owners of said bridge and the several railroad companies, or any of them desiring such use, shall fail to agree upon the sum or sums to be paid, and upon the rules and conditions to which each shall conform in using said bridge, all matters at issue between them shall be decided by the Secretary of War, upon a hearing of the allegations and proofs of the parties.

—disagreement with owner of bridge.

SEC. 4. That the bridge authorized to be constructed under this Act shall be built under and subject to such regulations for the security of the navigation of said river as the Secretary of War shall prescribe, and to secure that object the said company or corporation shall submit to the Secretary of War for his examination and approval designs and drawings of the bridge, and a map of the location, giving all details necessary to enable the Secretary of War to judge whether the location selected is a proper one; and until the said plans and location are approved by the Secretary of War the bridge shall not be commenced or built; and should any changes be made in the plans of said bridge during the progress of construction, such changes shall be subject to the approval of the Secretary of War, and all changes in said bridge required by the Secretary of War at any time, or its entire removal, shall be at the expense of the corporation owning or operating said bridge.

Secretary of War to make regulations.

—to approve plans.

—changes.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

SEC. 6. That this Act shall be null and void if actual construction of the bridge herein authorized is not commenced within one year and completed within three years from the date hereof.

Commencement and completion.

Approved, February 27, 1899.

February 27, 1899.

CHAP. 210.—An Act Making appropriations for the support of the Military Academy for the fiscal year ending June thirtieth, nineteen hundred.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated, out of any money in the Treasury not otherwise appropriated, for the support of the Military Academy for the fiscal year ending June thirtieth, nineteen hundred:

Military Academy appropriations.

Permanent establishment.

PERMANENT ESTABLISHMENT.

* * * * *

For pay of one instructor of practical military engineering (major), in addition to pay as captain, mounted, five hundred dollars;

* * * * *

For pay of eight assistant professors (captains) in addition to pay as first lieutenants, not mounted, four thousand dollars;

For pay of five senior instructors of cavalry, artillery, and infantry tactics, ordnance and gunnery, and practical military engineering (captains), in addition to pay as first lieutenants, not mounted, two thousand five hundred dollars;

* * * * *

Approved, February 27, 1899.

February 27, 1899.

CHAP. 211.—An Act To authorize the Grand Rapids Water Power and Boom Company, of Grand Rapids, Minnesota, to construct a dam and bridge across the Mississippi River.

Grand Rapids Water Power and Boom Co. may bridge, etc., Mississippi River at Grand Rapids, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Grand Rapids Water Power and Boom Company, of Grand Rapids, Minnesota, its successors and assigns, to construct across the Mississippi River, at a point within the limits of the village of Grand Rapids, Minnesota, to be approved by the Secretary of War, a dam, canal, and works necessarily incident thereto, for water-power purposes, and a wagon and foot bridge if desired in connection therewith for the purpose of travel. Said dam shall be so constructed that there can at any time be constructed in connection therewith a suitable lock for navigation purposes: *Provided*, That the Government of the United States may at any time take possession of said dam without compensation and control the same for purposes of navigation, but shall not do so to the destruction of the water power created by said dam to any greater extent than may be necessary to provide proper facilities for navigation: *Provided also*, That said dam shall be so constructed that it will not at any time raise the water surface, at a point three hundred feet above said dam, to an elevation higher than the floor of the sluices of the reservoir dam built by the Government at Pokegama Falls on the Mississippi River, in section thirteen, township fifty-five, range twenty-six west of the fourth principal meridian, Minnesota: *Provided further*, That said dam shall be so constructed as to provide for the free passage of saw logs without tolls or charges; and the said company shall construct and maintain, at its own expense, suitable fishways, to be approved by the United States Fish Commissioner; and the said company, its successors and assigns, shall make such change and modification in said dam, canal, and works incident thereto, and said bridge, as the Secretary of War may from time to time deem necessary in the interests of navigation, at its own cost and expense: *Provided further*, That in case any litigation arises from the obstruction of the channel by said dam, canal, and works incident thereto, or such bridge, the case may be tried in the proper court of the United States in the district in which said works are situated.

Dam, etc., for water-power purposes.

Provisos. Government control, etc.

Construction, etc.

Passage of saw logs.

Fishways.

Changes.

Litigation.

Amendment.

SEC. 2. That the right to amend, alter, or repeal this Act is hereby expressly reserved.

Commencement and completion.

SEC. 3. That this Act shall be null and void unless said dam herein authorized be commenced within one year and completed within three years from the date hereof.

Approved, February 27, 1899.

February 27, 1899.

CHAP. 212.—An Act Granting the right and authority to the Pensacola and Northwestern Railroad Company to build bridges over certain rivers in the State of Alabama.

Pensacola and Northwestern Railroad may bridge Alabama, etc., rivers, Alabama.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Pensacola and Northwestern Railroad Company, a railroad corporation organized under the laws of the States of Florida and Alabama, be, and is hereby, authorized and empowered to construct, maintain, and operate one bridge across each of the following-named rivers, all in the State of Alabama: The Alabama River, at a point in Monroe and Clarke counties, or in Wilcox County, Alabama; the Warrior River, at a point in Hale and Greene counties, Alabama, or at a point in Marengo and Greene counties, Alabama; the Tennessee River, at a point in the counties of Colbert and Lauderdale, Alabama; the Sipsey River, at a point in Pickens or Tuscaloosa County, Alabama; and to lay railroad tracks on the said bridges to run trains on same.

Railroad tracks.

To be lawful structures and post routes.

SEC. 2. That any bridges built under this Act and subject to its limitations shall be lawful structures, and shall be recognized and known as post routes; and they shall enjoy the same rights and privileges as other post-roads in the United States; and equal privileges in the use of said bridges shall be granted to all telegraph and telephone companies; and the United States shall have the right of way across said bridges and their approaches for postal telegraph purposes.

Telegraph, etc., companies.

Right of railroads to use.

SEC. 3. That all railroad companies desiring the use of said bridges shall have and be entitled to equal rights and privileges relative to the passage of railway trains over the same and over the approaches thereto, upon the payment of a reasonable compensation for such use; and in case the owner or owners of said bridges and the several railroad companies, or any of them, desiring such use shall fail to agree upon the sum or sums to be paid and upon the rules and conditions to which each shall conform in using said bridges, all matters at issue between them shall be decided by the Secretary of War, upon a hearing of the allegations and proofs of the parties.

—disagreement with owner of bridge.

Secretary of War to approve plans, etc.

SEC. 4. That all bridges authorized to be constructed under this Act shall be built under and subject to such regulations for the security of the navigation of said rivers as the Secretary of War shall prescribe, and to secure that object the said company or corporation shall submit to the Secretary of War, for his examination and approval, maps of location and designs and drawings of each of the bridges; and until the said plans and locations are approved by the Secretary of War the bridges shall not be commenced or built; and should any changes be made in the plans of said bridges, or any one of them, during the progress of construction or after completion, such changes shall be subject to the approval of the Secretary of War, and all changes in said bridges, or any one of them, required by the Secretary of War, at any time, or their entire removal, shall be

—changes.

made promptly by the corporations or persons owning or operating said bridges, at their own expense.

Amendment.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Commencement and completion.

SEC. 6. That this Act shall be null and void if actual construction of the bridges herein authorized is not commenced within one year and completed within three years from the date thereof.

Approved, February 27, 1899.

March 1, 1899.

CHAP. 329.—An Act To authorize the Georgia Pine Railway, of Georgia, to construct a bridge across the Flint River, a navigable stream in Decatur County, Georgia.

Georgia Pine Railway may bridge Flint River, Georgia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Georgia Pine Railway Company, of Georgia, be, and is hereby, authorized to construct and maintain and operate a bridge across the Flint River, a navigable stream, in the county of Decatur, State of Georgia; said bridge to be located at or near the town of Bainbridge.

Secretary of War to approve plans, etc.

—changes.

SEC. 2. That said bridge shall be built and located under and subject to such regulations for the security of navigation as the Secretary of War may prescribe; and to secure that object the said Georgia Pine Railway Company, of Georgia, shall submit for his examination designs and drawings of the bridge, and maps of the location, and until the said plans and location are approved by him the bridge shall not be commenced or built; and should any change be made in said bridge, before or after completion, such changes shall be likewise subject to the approval of the Secretary of War.

Aids to navigation.

Lights.

Expense of changes.

SEC. 3. That said bridge shall be kept and managed so as to offer reasonable and proper means for the passage of vessels and craft through or under the same; and for the safety of vessels passing at night there shall be displayed on said bridge at night, from sunset to sunrise, at the expense of the owners thereof, such lights or other signals as the Light-House Board may prescribe. And any changes in said bridge which the Secretary of War may at any time deem necessary, and order in the interests of navigation, shall be made by the owners thereof at their own expense.

Rights of railroads to use.

—disagreement with owner of bridge.

Telegraph, etc., companies.

SEC. 4. That all railroad companies desiring the use of the bridge authorized by this Act shall have and be entitled to equal rights and privileges relative to the passage of railway trains or cars over the same and over the approaches thereto upon the payment of a reasonable compensation for such use; and in case the owner or owners of said bridge and the several railroad companies, or any one of them, desiring such use shall fail to agree upon the sum or sums to be paid, and upon rules and conditions to which each shall conform in using said bridge, all matters at issue between them shall be decided by the Secretary of War upon a hearing of the allegations and proof of the parties; and equal privileges in the use of said bridge shall be granted to all telegraph and telephone companies.

SEC. 5. That the bridge constructed, maintained, and operated under this Act and according to its limitations shall be a lawful structure, and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transportation over the same of the mails, the troops, and the munitions of war of the United States than the rate per mile paid for transportation of said mails, troops, and munitions over the railroads and public highways leading to said bridge; and the United States shall have the right of way for postal, telegraph, and telephone purposes over said bridge.

To be lawful structure and post route.

SEC. 6. That this Act shall be null and void if actual construction of the said bridge be not commenced in one year and completed in three years from the date hereof.

Commencement and completion.

SEC. 7. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 1, 1899.

March 2, 1899.

CHAP. 352.—An Act For increasing the efficiency of the Army of the United States, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the date of approval of this Act the Army of the United States shall consist of * * * a Corps of Engineers, * * *

Army.
Composition of.

* * * * *

SEC. 7. That the * * * Corps of Engineers * * * shall consist of the officers and enlisted men now provided by law: *Provided*, That the battalion of engineers, and the officers serving therewith, shall constitute a part of the line of the Army:

Composition of staff departments unchanged.
Provisos.
Battalion of engineers to be part of line.

* * * * *

SEC. 13. * * * *And provided also*, That any officer now in the Army, who was graduated at the head of his class at the United States Military Academy and who is not now in the Corps of Engineers, may be appointed to the Corps of Engineers with the same grade and date of commission that he would have if he had been appointed to the Corps of Engineers on graduation; but said commission shall not entitle an officer to any back pay or allowance.

Appointment to engineer corps of officers who have graduated at head of class, Military Academy.
—no back pay.

* * * * *

SEC. 17. That no officer or private soldier shall be detailed to sell intoxicating drinks, as a bartender or otherwise, in any post exchange or canteen, nor shall any other person be required or allowed to sell such liquors in any encampment or fort or on any premises used for military purposes by the United States; and the Secretary of War is hereby directed to issue such general order as may be necessary to carry the provisions of this section into full force and effect.

Sale of intoxicating drinks prohibited.

SEC. 18. That all laws or parts of laws which conflict with the provisions of this Act are hereby repealed.

Repeal.

Approved, March 2, 1899.

March 2, 1899.

CHAP. 366.—An Act Authorizing the construction of three bridges across the Conecuh River, a navigable stream, in Escambia County, Alabama.

Escambia County may bridge the Conecuh River, Alabama.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the court of county commissioners of Escambia County, in the State of Alabama, be, and is hereby, authorized to construct, maintain, and operate three bridges across the Conecuh River, a navigable stream, in Escambia County, Alabama; said bridges to be located, one at Jurnegans Ferry, near Pollard, Alabama; one in the neighborhood of Hendleys Ferry, near Brewton, Alabama, and one near where Parkers Ferry now crosses said Conecuh River.

Location.

Secretary of War to approve plans, etc.

SEC. 2. That said bridges shall be located and built under and subject to such regulations for the security of navigation as the Secretary of War may prescribe; and to secure that object the said court of county commissioners shall submit for his examination designs and drawings of the bridges and maps of the locations, and until the said plans and locations are approved by him the bridges shall not be commenced or built; and should any changes be made in either of said bridges, before or after completion, such changes shall be likewise subject to the approval of the Secretary of War.

—changes.

Aids to navigation.

SEC. 3. That the said bridges shall be so kept and managed as to offer reasonable and proper means for the passage of vessels and other craft through or under the same; and for the safety of vessels passing at night there shall be displayed on said bridges, from sunset to sunrise, at the expense of the owners thereof, such lights or other signals as the Light-House Board may prescribe. And any changes in either of said bridges which the Secretary of War may at any time deem necessary, and order in the interests of navigation, shall be made by the owners thereof at their own expense.

Lights.

Expense of changes.

Commencement and completion.

SEC. 4. That this Act shall be null and void if actual construction of the said bridges be not commenced in one year and completed in three years from the date hereof.

Amendment.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, March 2, 1899.

March 2, 1899.

CHAP. 371.—An Act To authorize the construction of a bridge across the Monongahela River at Morgantown, in the State of West Virginia.

Monongalia County may bridge Monongahela River, at Morgantown, W. Va.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent of the United States of America is hereby given to the county court of Monongalia County, West Virginia, a corporation under the laws of said State, to construct and maintain a bridge over the Monongahela River at Morgantown, in said State.

Aids to navigation.

SEC. 2. That the bridge shall be so constructed that a free and unobstructed passage may be secured to all vessels and other water craft navigating said river; and any bridge constructed under this Act shall be located and built under and subject to such regulations for the securing of navigation of said river as the Secretary of War shall prescribe; and to secure that object the said county court shall submit to the Secretary of War, for his examination and approval, the designs and drawings of the bridge, piers, and approaches, and a map of the location, giving, for the space of at least one mile above and one mile below the proposed location, the topography of the banks of the river, the shore lines at high and low water, and the direction and strength of the current at all stages, and the soundings, accurately showing the bed of the stream, and the location of other bridge or bridges, wharfs, landings, or ferries, and shall furnish such other information as shall be required for a full and satisfactory understanding of the subject; and until said plan and location of the bridge are approved by the Secretary of War the bridge shall not be commenced or built; and after such approval by the Secretary of War the approved plans and designs for the bridge shall not be deviated from or added to, either during the construction or after the completion of the bridge, until the proposed change shall have been submitted to the Secretary of War and received his approval; and the said bridge shall be at all times so kept and managed as to offer reasonable and proper means for the passage of vessels under said bridge; and if at any time the navigation of said river shall in any manner be obstructed or impaired by the bridge authorized by this Act to be constructed, the Secretary of War shall have authority, and it shall be his duty, to require said company to alter and change said bridge at its own expense in such manner as may be proper to secure free and complete navigation without impediment.

Secretary of War to approve plans, etc.

—changes.

Lawful structure and post route.

SEC. 3. That any bridge built under this Act and subject to its limitations shall be a lawful structure and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transmission over the same of the mail, the troops and munitions of war of the United States than the rate per mile paid for the transportation over the public highways leading to said bridge, and it shall enjoy the rights and privileges of other post roads of the United States; and equal privileges in the use of said bridge shall be granted to all telegraph and telephone companies, and the United States shall have the right of way across said bridge and its approaches for said postal-telegraph purposes.

Telegraph, etc., companies.

Commencement and completion.

SEC. 4. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within one year and completed within three years from the date hereof.

Amendment.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, March 2, 1899.

March 3, 1899.

CHAP. 422.—An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred, and for other purposes.

District of Columbia.

Appropriations.

Half from District revenues.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the half of the following sums named, respectively, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, and the other half out of the revenues of the District of Columbia, for the purposes following, being for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred, namely:

General expenses.

GENERAL EXPENSES.

Executive office.

Commissioners.

FOR EXECUTIVE OFFICE: For two Commissioners, at five thousand dollars each; Engineer Commissioner, one thousand seven hundred and sixty-eight dollars (to make salary five thousand dollars);

* * * * *

PERMANENT SYSTEM OF HIGHWAYS.

Extension of highways.

Vol. 27, p. 532.

To pay the expenses of completing a plan for the extension of a permanent system of highways in conformity with the "Act to provide a permanent system of highways in that part of the District of Columbia lying outside of cities," approved March second, eighteen hundred and ninety-three, three thousand dollars; to be paid wholly out of the revenues of the District of Columbia.

* * * * *

Bridges.

BRIDGES.

Care.

For ordinary care of bridges, including keepers, oil, lamps, and matches, four thousand dollars.

Repairs, etc.

For construction and repairs of bridges, twenty-five thousand dollars.

Massachusetts avenue, across Rock Creek.

Toward the construction of a bridge across Rock Creek on the line of Massachusetts avenue extended, upon plans to be made by the Commissioners of the District of Columbia and approved by the Chief of Engineers of the Army, one hundred thousand dollars; and the Commissioners of the District of Columbia are authorized to enter into a contract for the construction of said bridge in accordance with said plans at a total cost for its completion, including foundations, not to exceed two hundred and twenty-five thousand dollars, to be paid for as appropriations may be made by law.

Washington Aqueduct.

WASHINGTON AQUEDUCT.

Maintenance.

For engineering, maintenance, and general repairs, twenty-one thousand dollars.

Conduit road.

For repairing the Conduit road, one thousand dollars.

For repairing the north connection of the by-conduit, Dalecarlia reservoir, three thousand dollars.

Filtering water supply.

For additional amount to enable the proper officer of the Government having charge of the Washington Aqueduct and the water supply to the city of Washington to make an investigation of the feasibility and propriety of filtering the water supply of Washington and to submit to Congress a full and detailed report thereon, and to meet all necessary expenses of said investigation, five thousand dollars, to be immediately available.

INCREASING THE WATER SUPPLY.

Washington Aqueduct tunnel.

Continuing work.

For continuing work on the Washington Aqueduct tunnel according to the estimate of the board of experts, two hundred thousand dollars.

* * * * *

ROCK CREEK PARK.

Rock Creek Park.

Care and improvement.
Vol. 26, p. 492.

For the care and improvement of Rock Creek Park, to be expended under the direction of the board of control of said park, the unexpended balance, amounting to twenty-three thousand six hundred and ninety-three dollars and forty-five cents, of the appropriation made by the Act approved September twenty-seventh, eighteen hundred and ninety, for expenses of acquiring said park, is hereby appropriated.

* * * * *

Approved, March 3, 1899.

March 3, 1899.

CHAP. 423.—An Act Making appropriation for the support of the Regular and Volunteer Army for the fiscal year ending June thirtieth, nineteen hundred.

Army appropriations.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and they are hereby, appropriated, out of any money in the Treasury not otherwise appropriated, for the support of the Army for the year ending June thirtieth, nineteen hundred:

* * * * *

MISCELLANEOUS.

* * * * *

Pay to officer, public buildings and grounds.

For additional pay to officer in charge of public buildings and grounds at Washington, District of Columbia, one thousand dollars.

* * * * *

Mileage to officers.
Provisos.
Limit.

Travel on bond-aided, etc., railroads, etc.

For mileage to officers and contract surgeons, when authorized by law, five hundred thousand dollars: *Provided*, That hereafter the maximum sum to be allowed and paid to any officer of the Army shall be seven cents per mile, distances to be computed over the shortest usually traveled routes: *Provided further*, That when any officer so traveling shall travel in whole or in part on any railroad on which the troops and supplies of the United States are entitled to be transported free of charge, or over any of the bond-aided Pacific-railroads, or over the railroad of any railroad company which is entitled to receive only fifty per centum of the compensation earned by such company for transportation services rendered to the United States, he shall be furnished with a transportation request by the Quartermaster's Department for such travel: and the cost of the transportation so furnished shall be a charge against the officer's mileage account for such travel, to be deducted by the Paymaster who pays the account, at rates paid by the general public for travel over such roads: *Provided further*, That officers who, by reason of the decision of the accounting officers of the Treasury, have been compelled to pay from their own means one-half of the cost of their travel fare over railroads known as fifty per centum railroads, shall be reimbursed the same by the Pay Department, and paymasters against whom disallowances have been made by the accounting officers of the Treasury under such decision shall have the amount so disallowed passed to their credit: *Provided further*, That actual expenses only shall be paid to officers when traveling to and from our island possessions in the Atlantic and Pacific oceans.

Fifty per centum railroads reimbursement to certain officers.

Actual expense only to island possessions.

* * * * *

Engineer Department.

ENGINEER DEPARTMENT.

Incidental expenses.

ENGINEER DEPOT AT WILLETS POINT, NEW YORK: For incidental expenses of the depot, including fuel, lights, chemicals, stationery, hardware, extra-duty pay to soldiers necessarily employed for periods not less than ten days as artificers on work in addition to and not strictly in the line of their military duties, such as carpenters, blacksmiths, draftsmen, printers, lithographers, photographers, engine drivers, teamsters, wheelwrights, masons, machinists, painters, overseers, laborers, repairs of, and for materials to repair, public buildings, machinery, and unforeseen expenses, five thousand dollars.

Materials.

For the purchase of material for use of United States Engineer School and for instruction of engineer troops at Willets Point in their special duties as sappers and miners; for land and submarine mines, pontoniers, torpedo drill, and signaling, one thousand five hundred dollars.

Instruments.

For purchase and repair of instruments, to be issued to officers of the Corps of Engineers and to officers detailed and on duty as acting engineer officers, for use on public works and surveys, three thousand dollars.

For pontoon trains, intrenching tools, instruments, and drawing materials, twenty-five thousand dollars. For services of surveyors, draftsmen, photographers, clerks to engineer officers on the staff of division, corps, and department commanders, twenty-five thousand dollars.

Library.

LIBRARY OF THE UNITED STATES ENGINEER SCHOOL: For purchase and binding of professional works of recent date treating of military and civil engineering and kindred scientific subjects, five hundred dollars.

Total for engineer department, sixty thousand dollars.

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Approved, March 3, 1899.

March 3, 1899.

CHAP. 424.—An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred, and for other purposes.

Appropriations for sundry civil expenses.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated, for the objects hereinafter expressed, for the fiscal year ending June thirtieth, nineteen hundred, namely:

* * * * *

Miscellaneous objects.

MISCELLANEOUS OBJECTS.

* * * * *

Yosemite National Park. Expenses.

Proviso.

Commission to investigate certain toll roads, etc.

IMPROVEMENT OF YOSEMITE NATIONAL PARK: For the protection of the Yosemite National Park, and construction of bridges, fencing, and trails, and improvement of roads, other than toll roads, to be expended under the supervision of the Secretary of the Interior, four thousand dollars: *Provided*, That so much thereof as may be necessary shall be expended as follows: The Secretary of War shall appoint three commissioners, one from the Engineer Corps of, and one from the officers of, the Regular Army of the United States, both to act herein without additional compensation; and the third a civil engineer and member of the department of highways of the State of California, who shall be paid herein only his actual expenses. The duties of said commission shall be to examine, determine the lengths, widths, elevations, grades, conditions, ownership, cost of construction and present values and annual cost of maintenance, rates of toll charged, annual tolls collected, and the length of season open to travel and actually traveled by the public of each the "Big Oak Flat toll road," "The Coulterville toll road," "The Wawona toll road," and the "Tioga road," all in and about the Yosemite National Park, California; and also, so far as applicable, said data with reference to new wagon road by the best attainable new route from said Yosemite Valley to a suitable point in Merced County, and of a second such in Mariposa County, and of a third such to railroad connection in Tuolumne County, and to any other practicable route, and also to a new wagon road connecting said "Tioga road" with a road traveled by wagon in Mono or Inyo County, said State, and also to a wagon road to Hetch Hetchy Valley in said park. Said commission is authorized to do all acts and things necessary to complete said purpose, and shall report to the Secretary of the Interior the results of such examination.

* * * * *

Memorial bridge, Potomac River.

Plans, estimates, etc.

Memorial bridge across Potomac River: To enable the Chief of Engineers of the Army to continue the examination of the subject and to make or secure designs, calculations, and estimates for a memorial bridge from the most convenient point of the Naval Observatory grounds or adjacent thereto, across the Potomac River to the most convenient point of the Arlington estate property, the sum of five thousand dollars.

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War Department.

UNDER THE WAR DEPARTMENT.

* * * * *

Washington, D. C.

BUILDINGS AND GROUNDS IN AND AROUND WASHINGTON.

Buildings and grounds.

For the improvement and care of public grounds, as follows:

Improvement and care.

For improvement and maintenance of grounds south of Executive Mansion, four thousand dollars.

For ordinary care of greenhouses and nursery, two thousand dollars.

For ordinary care of Lafayette Park, one thousand dollars.

For ordinary care of Franklin Park, one thousand dollars.

For improvement and ordinary care of Lincoln Park, two thousand dollars.

For care and improvement of Monument Grounds, three thousand dollars.

Reservation No. 17.

Proviso. Expenditure.

For continuing improvement of reservation numbered seventeen, and site of old canal northwest of same, three thousand dollars: *Provided*, That no part thereof shall be expended upon other than property belonging to the United States.

For construction and repair of post-and-chain fences, repair of high iron fences, constructing stone coping about reservations, painting watchmen's lodges, iron fences, vases, lamps, and lamp-posts; manure, and hauling the same, and removing snow and ice; purchase and repair of seats and tools; trees, tree and plant stakes, labels, lime, whitewashing, and stock for nursery, flower pots, twine, baskets, wire, splints, moss, and lycopodium, to be purchased by contract or otherwise, as the Secretary of War may determine; care, construction, and repair of fountains; and abating nuisances, cleaning statues, and repairing pedestals, fifteen thousand eight hundred and fifty dollars.

For improvement, care, and maintenance of various reservations, twenty thousand dollars.

For improvement, maintenance, and care of Smithsonian grounds, two thousand five hundred dollars.

For improvement, care, and maintenance of Judiciary Park, two thousand five hundred dollars.

For the completion of the concrete or asphalt pavement of E street northwest through said park, from Fourth street to Fifth street northwest, two thousand dollars.

For paving roadway on east and south sides of State, War, and Navy building, fourteen thousand three hundred dollars.

For laying asphalt walks in various reservations, two thousands dollars.

Limit for concrete pavements.

That under appropriations herein contained no contract shall be made for making or repairing concrete or asphalt pavements in Washington City at a higher price than one dollar and eighty cents per square yard for a quality equal to the best laid in the District of Columbia prior to July first, eighteen hundred and eighty-six, and with a base of not less than six inches in thickness.

For improvement and maintenance of Executive Mansion grounds (within iron fence), one thousand dollars.

For one assistant engineer in office of public buildings and grounds, one thousand eight hundred dollars.

Executive Mansion. EXECUTIVE MANSION: For care, repair, and refurnishing of Executive Mansion, thirty-six thousand dollars, to be expended by contract or otherwise, as the President may determine.

Fuel, etc. For fuel for the Executive Mansion, greenhouses, and stable, three thousand dollars.

For care and necessary repair of greenhouses, five thousand dollars.

For repairs to conservatory, Executive Mansion, two thousand dollars.

Lighting. LIGHTING THE EXECUTIVE MANSION AND PUBLIC GROUNDS: For gas, pay of lamplighters, gas fitters, and laborers; purchase, erection, and repair of lamps and lamp-posts; purchase of matches, and repairs of all kinds; stoves, fuel, and lights for office, office stable, watchmen's lodges, and for the greenhouses at the nursery, twelve thousand five hundred dollars: *Provided*, That for each five-foot burner not connected with a meter in the lamps on the public grounds not more than twenty dollars shall be paid per lamp for gas, including lighting, cleaning, and keeping the lamps in repair, under any expenditure provided for in this Act; and said lamps shall burn every night on the average from fifteen minutes after sunset to forty-five minutes before sunrise; and authority is hereby given to substitute other illuminating material for the same or less price, and to use so much of the sum hereby appropriated as may be necessary for that purpose: *Provided*, That before any expenditures are made from the appropriations herein provided for, the contracting gas company shall equip each lamp with a self-regulating burner and tip, so combined and adjusted as to secure, under all ordinary variations of pressure and density, a consumption of five cubic feet of gas per hour.

Proviso.

—maximum per lamp.

—to burn every night, etc.

Self-regulating burners.

Electric lights. For lighting six arc electric lights in Executive Mansion grounds within the iron fence three hundred and sixty-five nights, at not exceeding twenty-five cents per light per night, which shall cover the entire cost to the United States of lighting and maintaining in good order each electric light in said grounds, five hundred and forty-seven dollars and fifty cents.

—parks, etc. For lighting arc electric lights in public grounds as follows: For seven in grounds south of the Executive Mansion, at not exceeding twenty cents per light per night; for thirty-two in Lafayette, Franklin, Judiciary, and Lincoln parks, and fourteen in grounds south of Executive Mansion and in Monument Park, at not exceeding twenty-five cents per light per night, which sums shall cover the entire cost of lighting and maintaining in good order each of said arc electric lights; in all, four thousand seven hundred and eight dollars and fifty cents, one-half of which sum shall be paid from the revenues of the District of Columbia and the other half from the Treasury of the United States.

Repair of water pipes.

REPAIR OF WATER PIPES: For repairing and extending water pipes, purchase of apparatus for cleaning them, purchase of hose, and for cleaning the springs and repairing and renewing the pipes of the same that supply the Capitol, the Executive Mansion, and the building for the State, War, and Navy Departments, two thousand five hundred dollars.

Telegraph, Capitol, Departments, etc.

TELEGRAPH TO CONNECT THE CAPITOL WITH THE DEPARTMENTS AND GOVERNMENT PRINTING OFFICE: For care and repair of existing lines, one thousand five hundred dollars.

Washington Monument. Maintenance.

WASHINGTON MONUMENT: For the care and maintenance of the Washington Monument, namely: For one custodian, at one hundred dollars per month; one steam engineer, at eighty dollars per month; one assistant steam engineer, at sixty dollars per month; one fireman, at fifty dollars per month; one assistant fireman, at forty-five dollars per month; one conductor of elevator car, at seventy-five dollars per month; one attendant on floor, at sixty dollars per month; one attendant on top floor, at sixty dollars per month; three night and day watchmen, at sixty dollars per month each; in all, eight thousand five hundred and twenty dollars.

—fuel, light, etc.

For fuel, lights, oil, waste, packing, tools, matches, paints, brushes, brooms, lanterns, rope, nails, screws, lead, electric lights, heating apparatus, oil stoves for elevator car and upper and lower floors, repairs to engines, boilers, dynamos, elevator, and repairs of all kinds connected with the Monument and machinery, and purchase of all necessary articles for keeping the Monument, machinery, elevator, and electric-light plant in good order, three thousand dollars.

* * * * *

Yellowstone National Park.

IMPROVEMENT OF THE YELLOWSTONE NATIONAL PARK: For the repair and maintenance of existing roads and bridges and improvement and protection of the Yellowstone National Park, to be expended by and under the direction of the Secretary of War, including not exceeding five thousand dollars to be immediately available, forty thousand dollars.

* * * * *

Engineer Department.

ENGINEER DEPARTMENT.

Rivers and harbors, improvements.

Toward the construction of works on harbors and rivers under contracts or otherwise and within the limits authorized by law, namely:

Humboldt, Cal.

For improving harbor and bay at Humboldt, California: Completing improvement, one hundred and forty-three thousand one hundred and fifteen dollars.

Savannah, Ga.

Improving harbor at Savannah, Georgia: For completing improvement, two hundred thousand dollars.

Cumberland Sound, Ga. and Fla.

Improving Cumberland Sound, Georgia and Florida: For continuing improvement, four hundred thousand dollars.

Boston, Mass.

Improving harbor at Boston, Massachusetts: For completing improvement, one hundred and sixty three thousand seven hundred and fifty-one dollars.

Buffalo, N. Y.

Improving harbor at Buffalo, New York: For continuing improvement, four hundred and eighty-five thousand four hundred and ninety-eight dollars.

Delaware Bay, Del.

Harbor of refuge, Delaware Bay, Delaware: For continuing construction, three hundred and seventy-seven thousand dollars.

Winyaw Bay, S. C.

Improving Winyaw Bay, South Carolina: For continuing improvement of harbor at Winyaw Bay, fifty-eight thousand five hundred dollars.

Sabine Pass, Tex.

Improving Sabine Pass, Texas: For continuing improvement of harbor at Sabine Pass, two hundred and sixty-four thousand dollars.

Cleveland, Ohio.

Improving harbor at Cleveland, Ohio: For continuing improvement, one hundred thousand dollars.

Duluth, Minn., Superior, Wis.

Improving harbor at Duluth, Minnesota, and Superior, Wisconsin: For continuing improvement, three hundred thousand dollars.

Oakland, Cal.

Improving harbor at Oakland, California: For continuing improvement under existing project, one hundred and thirty-three thousand dollars.

San Pedro, Cal.
Vol. 29, p. 213.

Improving harbor at San Pedro, California: For continuing construction of breakwater at San Pedro, California, in accordance with the plans and specifications of the board appointed by the President, as provided in the Act of June third, eighteen hundred and ninety-six, two hundred thousand dollars.

Grays Harbor, Wash.

Improving Grays Harbor, Washington: For continuing improvement of harbor and bar entrance, two hundred and eighty-five thousand dollars.

Providence River, Narragansett Bay, R. I.

Improving Providence River, and Narragansett Bay, Rhode Island: For continuing improvement, ten thousand dollars.

Bayou Plaquemine, La.

Improving Bayou Plaquemine, Louisiana: For continuing improvement, four hundred thousand dollars.

Falls of Ohio at Louisville.

Improving Falls of Ohio River at Louisville, Kentucky: For completing improvement, including Indiana Chute Falls, fifteen thousand dollars.

For continuing construction of dams numbered two, three, four, and five, between Davis Island Dam and dam numbered six, four hundred thousand dollars.

Illinois and Mississippi Canal.

Illinois and Mississippi Canal: For continuing construction, seven hundred thousand dollars.

Mississippi River.
Mouth of the Ohio to St. Paul.

Improving Mississippi River from the mouth of the Ohio River to Saint Paul, Minnesota: For continuing improvement from the mouth of the Ohio River to the mouth of the Missouri River, six hundred and seventy-three thousand three hundred and thirty-three dollars and thirty-three cents: *Provided*, That of this amount ten thousand dollars shall be expended in the completion of work which has been commenced for the protection of the bank on the Missouri side and to deepen and straighten the channel at Claryville, in Perry County, in the State of Missouri; ten thousand dollars shall be expended for the protection of the bank on the Missouri side and to deepen and straighten the channel at Wittenberg, in Perry County, in the State of Missouri; and fifty thousand dollars, or so much thereof as may be necessary, shall be expended to improve the channel of the river and to protect the east bank of the Mississippi River from caving in and being washed away

Proviso.
Channel at Claryville, Mo.
—Wittenberg, Mo.

at or near a point opposite the mouth of the Missouri River and extending south along said east bank.

Mouth of Missouri to St. Paul.
Proviso.
Quincy, Ill.
Rock Island, Ill.
Levee, west side, etc.
Davenport, Iowa.
Clinton, Iowa.

For continuing improvement from the mouth of the Missouri River to Saint Paul, eight hundred and twenty-six thousand six hundred and sixty-six dollars and sixty-seven cents: *Provided*, That of this amount ten thousand dollars shall be expended for removing the sand bar in front of the steamboat landing at Quincy, in the State of Illinois; ten thousand dollars shall be expended for dredging the channel at Quincy Bay, at Quincy, in the State of Illinois; five thousand dollars shall be expended for the repair and maintenance of the natural and artificial banks of the Mississippi River from Warsaw to Quincy, in the State of Illinois; five thousand dollars shall be expended for maintaining the harbor at Rock Island, Illinois; fifty thousand dollars, or so much thereof as may be necessary, for the completion of a levee on the west bank of the Mississippi River from the mouth of Flint Creek, in Des Moines County, Iowa, to the mouth of the Iowa River, in Louisa County, Iowa; ten thousand dollars shall be expended to deepen the harbor at Davenport, Iowa, from the Government bridge to the island owned by the city of Davenport, in the Mississippi River; and twenty-five thousand dollars shall be expended for improving and straightening the channel at and near Clinton, Iowa.

Mississippi River Commission.
Head of Passes to Ohio.
Expenses, etc.
Proviso.
Greenville, Miss.
Caruthersville, Mo.
New Madrid, Mo.
Helena, Ark.

Improving Mississippi River: For continuing improvement of Mississippi River from Head of the Passes to the mouth of the Ohio River, including salaries, clerical, office, traveling, and miscellaneous expenses of the Mississippi River Commission, two million five hundred and eighty-three thousand three hundred and thirty-three dollars: *Provided*, That of said sum fifty thousand dollars shall be used in the work of rectifying the bank at and near Greenville Harbor, in Mississippi; thirty-five thousand dollars shall be used in rectifying the banks at and near the city of Caruthersville, Missouri; forty thousand dollars shall be used for completing revetment work at New Madrid, Missouri; and thirty thousand dollars shall be used in improving the harbor and rectifying the banks at and near Helena, Arkansas.

Missouri River Commission.
Expenses, etc.
Proviso.
St. Joseph, Mo.
Omaha, Nebr.; Council Bluffs, Iowa.
Leavenworth, Kans.
Jefferson City, Mo.
Nigger Bend, Mo.

Improving Missouri River from mouth to Sioux City, Iowa: For continuing improvement of Missouri River from its mouth to Sioux City, Iowa, including salaries, clerical, office, traveling, and miscellaneous expenses of the Missouri River Commission, surveys, permanent bench marks, and gauges, two hundred thousand dollars: *Provided*, That of this amount the following sums, or so much thereof as may be necessary, in the discretion of the Secretary of War, shall be expended in works of improvement at the following places, namely, Saint Joseph, Missouri, thirty thousand dollars; Omaha, Nebraska, and Council Bluffs, Iowa, fifty thousand dollars; opposite Leavenworth, Kansas, five thousand dollars; Jefferson City, Missouri, twenty thousand dollars to improve the harbor at Jefferson City by compelling the current and channel of the river to the south side thereof; Nigger Bend, Missouri, ten thousand

olph Bend, Missouri, fifteen thousand dollars;
uri, ten thousand dollars.

Randolph Bend, Mo.
Lexington, Mo.

* * *

BJECTS, WAR DEPARTMENT.

Miscellaneous.

use of the War Department,
usand dollars.

Maps.

AND NORTHWESTERN LAKES:
charts for use of navigators, and
for chart printing, three thousand

Survey of northern, etc., lakes.

additions to, and correcting engraved
available until expended, twenty-five thou-
ars.

NSPORTATION OF REPORTS AND MAPS TO FOREIGN
NTRIES: For the transportation of reports and maps
o foreign countries through the Smithsonian Institution, one hundred dollars.

Transporting maps.

* * * * *

CALIFORNIA DEBRIS COMMISSION: For defraying the expenses of the commission in carrying on the work authorized by the Act of Congress approved March first, eighteen hundred and ninety-three, fifteen thousand dollars: *Provided*, That officers of the commission traveling on duty in connection with the commission's work may be paid their actual traveling expenses in lieu of mileage allowed by law, and shall hereafter receive no mileage.

California Débris Commission.
Vol. 27, p. 507.
Proviso.
Traveling expenses, officers.

HARBOR OF NEW YORK: For prevention of obstructive and injurious deposits within the harbor and adjacent waters of New York City:

New York Harbor.

For pay of inspectors and deputy inspectors, office force, and expenses of office, ten thousand two hundred and sixty dollars;

Inspectors, etc.

For pay of crews and maintenance of four steam tugs and three launches, forty-eight thousand seven hundred and forty dollars;

Vessels.

For new boiler and installing same in steam tug Nimrod, six thousand five hundred dollars, to be immediately available;

For purchase or construction of one steam tug, forty-five thousand dollars, to be immediately available;

In all, one hundred and ten thousand five hundred dollars.

DEEP WATERWAYS COMMISSION: For completing surveys, examinations, and investigations (including estimate of cost) of deep waterways, and the routes thereof, between the Great Lakes and the Atlantic tide waters, as recommended by the report of the Deep Waterways Commission transmitted by the President to Congress January eighteenth, eighteen hundred and ninety-seven; such surveys, examinations, and investigations to be made by the board of three engineers designated and appointed by the President for this purpose July twenty-eighth, eighteen hundred and ninety-seven, in compliance with the provisions of the Act of June fourth, eighteen hundred and

Deep Waterways Commission.
Laws, 1st sess. 55th Cong., p. 50.

ninety-seven, to be immediately available, ninety thousand dollars.

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Government Printing Office. Construction of building authorized.

GOVERNMENT PRINTING OFFICE BUILDING: That there be constructed, upon the land acquired by the United States in square numbered six hundred and twenty-four, in the city of Washington, District of Columbia, under the provisions of the Act entitled "An Act making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-nine and for other purposes," approved July first, eighteen hundred and ninety-eight, a fireproof building for the use of the Government Printing Office, at a total cost, including approaches, elevators, lighting, and heating apparatus, not exceeding two million dollars.

Laws, 2d sess. 55th Cong., p. 648.

Chief of Engineers, Army, to supervise, etc.

That the building herein provided for shall be erected under the direction and supervision of the Chief of Engineers of the Army, by contract or hired labor, or both, as may be to the best interests of the United States, and upon plans and specifications to be prepared by him and approved by the Public Printer. And the said Chief of Engineers is hereby authorized to enter into a contract or contracts for the construction of the whole or of any part of said building and for the removal of the old dwellings and other buildings now standing upon said land, subject to appropriations to be made therefor by Congress, and he shall also have the employment of all persons connected with the work: *Provided, however*, That the selection and appointment of a competent architect to prepare the plans and specifications for the elevations of said building shall be made by the said Chief of Engineers and the Public Printer jointly.

Contracts.

Proviso. Plans.

Appropriation.

Toward the construction of said building and for each and every purpose connected therewith, including the cost of all professional and other personal services that the Chief of Engineers of the Army may deem necessary, and for the rent of office rooms in a locality convenient to the work, three hundred and fifty thousand dollars, to be immediately available. This appropriation and all appropriations which may hereafter be made for this purpose shall be expended under the direction and supervision of the said Chief of Engineers.

Appropriation for salaries to be in full, etc.

SEC. 2. That all sums appropriated by this Act for salaries of officers and employees of the Government shall be in full for such salaries for the fiscal year nineteen hundred, and all laws or parts of laws in conflict with the provisions of this Act be, and the same are hereby, repealed.

Repeal.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 425.—An Act Making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes.

Appropriations for rivers and harbors.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums of money be, and are hereby, appropriated, to be paid out of any money in the Treasury not otherwise appropriated, to be immediately available, and to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers, for the construction, completion, repair, and preservation of the public works hereinafter named:

Moosabec Bar, Me.

Improving Moosabec Bar, Maine: Completing improvement, eleven thousand dollars.

Breakwater, Mount Desert, Me.

For construction of breakwater from Mount Desert to Porcupine Island, Maine: Continuing improvement, twenty thousand dollars.

Harbors.
Sullivan Falls, Me.

Improving harbor at Sullivan Falls, Maine, in accordance with the approved project, five thousand dollars.

Vinalhaven, Me.

Improving Carvers Harbor, at Vinalhaven, Maine: Continuing improvement, fifteen thousand dollars.

Cape Porpoise, Me.

Improving harbor at Cape Porpoise, Maine, in accordance with the report printed in House Document Number One hundred and sixty, Fifty-fifth Congress, third session, seventy thousand dollars: *Provided,* That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the project recommended in said report, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate fifty-five thousand dollars, exclusive of the amount herein appropriated.

Proviso.
Contracts.

Little Harbor, N. H.

Improving harbor of refuge at Little Harbor, New Hampshire: Continuing improvement, twelve thousand dollars.

Burlington, Vt.

Improving harbor at Burlington, Vermont: Continuing improvement, fifteen thousand dollars.

Boston, Mass.
Provisos.
—Great Head, etc.

Improving harbor at Boston, Massachusetts: Continuing improvement, seventy-five thousand dollars: *Provided,* That this sum may, in the discretion of the Secretary of War, be used in the preservation and improvement of said harbor, including the protection of Great Head and other headlands and islands in and about said harbor, to prevent further washing away by the sea: *Provided further,* That five thousand dollars of this sum may, in the discretion of the Secretary of War, be used in improving Chelsea Creek: *Provided further,* That the Secretary of War may use five thousand dollars thereof and enter into a contract or contracts for such materials and work as may be necessary for the completion of the improvement in accordance with the project recommended in the report printed on pages eight hundred and eighty-seven et sequentes of the Report of the Chief of Engineers for eighteen hundred and ninety-eight; such improvement to provide for a channel one thousand two hundred feet wide and thirty feet deep from the main ship channel in President Roads through Broad Sound Channel, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggre-

Chelsea Creek.

Contracts.

Channel from ship channel, President Roads, etc.

gate four hundred and fifty thousand dollars, exclusive of the amount herein and heretofore appropriated.

Nantucket, Mass.

Improving harbor of refuge at Nantucket, Massachusetts: Continuing improvement, twenty thousand dollars.

Newburyport, Mass.
Proviso.
—removing "North Rock."

Improving harbor at Newburyport, Massachusetts: Continuing improvement, twenty-five thousand dollars: *Provided*, That of this appropriation a sum not exceeding three thousand dollars may, in the discretion of the Secretary of War, be expended in removing from Newburyport Harbor, a rock, called "North Rock."

Plymouth, Mass.

Improving harbor at Plymouth, Massachusetts: For maintenance, ten thousand dollars; for repairs made necessary by the great storm of November, eighteen hundred and ninety-eight, according to plans and estimate submitted January twentieth, eighteen hundred and ninety-nine, seventy-five thousand dollars.

Provincetown, Mass.

Improving harbor at Provincetown, Massachusetts: For maintenance, ten thousand dollars.

Scituate, Mass.

Improving harbor at Scituate, Massachusetts: For maintenance and repairs, fifteen thousand dollars.

Hyannis, Mass.

Improving harbor at Hyannis, Massachusetts: Completing improvement, two thousand one hundred and sixty-two dollars.

Manchester, Mass.

Improving harbor at Manchester, Massachusetts, in accordance with the project submitted July thirtieth, eighteen hundred and ninety-seven, five thousand dollars.

Vineyard Haven, Mass.

Improving harbor at Vineyard Haven, Massachusetts: Completing improvement, three thousand dollars.

Sandy Bay, Cape Ann, Mass.
Board to examine, etc.

Improving harbor of refuge at Sandy Bay, Cape Ann, Massachusetts: Continuing improvement, two hundred and fifty thousand dollars. And the Secretary of War shall appoint a board of three engineers, whose duty it shall be to examine said project and report whether any modification of the same should, in their judgment, be made, with an estimate of the cost of completing the same, and so much of the above appropriation as may be necessary shall be used for that purpose.

Gloucester, Mass.

Improving harbor at Gloucester, Massachusetts: Continuing improvement, forty thousand dollars.

Sea-wall, Marblehead, Mass.

For the repair of the sea-wall at Marblehead, Massachusetts, made necessary by the great storm of November, eighteen hundred and ninety-eight, one thousand dollars, to be expended under the direction of the Secretary of War.

Harbor, Duxbury, Mass.

Improving harbor at Duxbury, Massachusetts, and for repairs made necessary by storm, twelve thousand dollars.

New Bedford, Mass.

Improving harbor at New Bedford, Massachusetts: Continuing improvement under the approved project of eighteen hundred and ninety-five, ten thousand dollars, and to complete the channel east of Fish Island in accordance with the report printed on page nine hundred and thirty of the Annual Report of the Chief of Engineers for eighteen hundred and ninety-seven, thirty-four thousand dollars.

Chatham, Mass.

Improving harbor at Chatham, Massachusetts: Completing improvement, three thousand seven hundred and thirty-two dollars and seventy-nine cents.

Improving Woods Hole Channel, Massachusetts: Continuing improvement, twenty thousand dollars. Woods Hole Channel, Mass.

Improving the harbor of Fall River, Massachusetts, in accordance with the plan numbered two in report printed on pages nine hundred and thirty-one et sequentes of the Annual Report of the Chief of Engineers for eighteen hundred and ninety-seven, twenty thousand dollars. Fall River, Mass., harbor.

Improving harbor at Block Island, Rhode Island: Continuing improvement and maintenance, ten thousand dollars. Block Island, R. I.

Improving harbor at Newport, Rhode Island: Continuing improvement, fifteen thousand dollars. Newport, R. I.

Improving harbor, Great Salt Pond, Block Island, Rhode Island: Completing improvement, fifty thousand dollars. Great Salt Pond.

Improving harbor at Sakonnet Point, Rhode Island: Completing improvement according to the plan submitted June twenty-fourth, eighteen hundred and ninety-seven, twenty-five thousand dollars. Sakonnet Point, R. I.

Improving harbor at Bridgeport, Connecticut: Continuing improvement in accordance with the modified and extended project referred to by the Chief of Engineers in his annual report for the fiscal year ending June thirtieth, eighteen hundred and ninety-eight, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the improvement, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and fifty thousand dollars, exclusive of the amount herein and heretofore appropriated. Bridgeport, Conn. *Proviso.* Contracts.

Improving New Haven Harbor, Connecticut, in accordance with the project printed as House Document Number Eighty-two, Fifty-fifth Congress, first session, fifty thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for materials and work necessary to complete so much of said project as includes a channel twenty feet deep through Long Island Sound from Tomlinson's Bridge, including three interior basins affording separate anchorages with depths of twenty, sixteen, and twelve feet, respectively, and connected by adequate channels, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and ninety-five thousand dollars, exclusive of the amount herein and heretofore appropriated. New Haven, Conn. *Proviso.* Contracts. Channel through Long Island Sound, etc.

Improving harbor at Five Mile River, Connecticut: Continuing improvement, two thousand five hundred dollars. Five Mile River, Conn.

Improving harbor at Stamford, Connecticut: Continuing improvement, six thousand dollars. Stamford, Conn.

Improving harbor at Norwalk, Connecticut: For maintenance, two thousand dollars. Norwalk, Conn.

Improving harbor at Buffalo, New York: For maintenance, seventy-five thousand dollars. Buffalo, N. Y.

For improvement of the Buffalo entrance to Erie Basin and Black Rock Harbor, New York, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as —entrance to Erie Basin, etc. *Proviso.* Contracts.

may be necessary for the completion of said project, in accordance with the recommendation of the Secretary of War, House Document Number Seventy-two, Fifty-fifth Congress, first session, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and ninety-eight thousand one hundred and thirteen dollars and eighty cents, exclusive of the amount herein appropriated.

Charlotte, N. Y.

Improving harbor at Charlotte, New York: For maintenance, seven thousand dollars.

Great Sodus Bay, N. Y.

Improving harbor at Great Sodus Bay, New York: For maintenance, fourteen thousand dollars.

Little Sodus Bay, N. Y.

Improving harbor at Little Sodus Bay, New York: For maintenance, five thousand five hundred dollars.

Ogdensburg, N. Y.

Improving harbor at Ogdensburg, New York: Continuing improvement, fifteen thousand dollars.

Oswego, N. Y.

Improving harbor at Oswego, New York: Continuing improvement, sixty thousand dollars, of which amount ten thousand dollars may be used for repair of the breakwater.

New York Harbor.
Maintenance.
Channel from Narrows to the sea.

Improving New York Harbor, New York: For maintenance, one hundred thousand dollars. For improving said harbor by a deep channel, two thousand feet wide and forty feet deep from the Narrows, by the so-called East Channel across Sandy Hook Bar to the open sea, in accordance with the recommendations contained in House Document Numbered One hundred and fifty-nine, Fifty-fifth Congress, third session, one million dollars: *Provided*, That the Secretary of War may forthwith enter into a contract or contracts for such materials and work as may be necessary for the completion of said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three million dollars, exclusive of the amount herein and heretofore appropriated.

Proviso.
Contracts.

—work may be performed by Secretary of War.

If, however, the Secretary of War shall be unable to make a contract or contracts for the completion of said project for a sum within the amounts above specified, then the said one million dollars herein appropriated, or so much thereof as may be necessary, shall be applied by him in the construction or purchase of such dredges, steamboats and other plant, machinery and appliances as may be necessary to prosecute said project, and shall cause the work on said project to be entered upon and prosecuted under the charge of the Secretary of War by employment of labor and materials necessary therefor, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate the said sum of three million dollars exclusive of the one million dollars herein appropriated.

Bay Ridge and Red Hook channels.
Proviso.
Location of improvement.

Improving Bay Ridge Channel and Red Hook Channel in the harbor of New York: Continuing improvement, one hundred thousand dollars: *Provided*, That the work shall be begun at the forty-foot curve at the southerly end of Bay Ridge Channel, and be continued through it along the Brooklyn shore to Twenty-eighth street until the said Bay Ridge Channel shall have a uniform depth of forty feet at low tide and a width of one thousand two hundred feet; and the improvement of the Red Hook Channel shall be

Contracts.

begun on its southerly end and at its junction with the Bay Ridge Channel, and be continued through it to its junction on its northerly end with the Buttermilk Channel until said Red Hook Channel shall have been made to a depth of forty feet at low tide and a width of one thousand two hundred feet: *And provided further*, That contracts may be entered into by the Secretary of War for the completion of said Bay Ridge Channel and Red Hook Channel, to be paid for as appropriations may from time to time be made by law, not exceeding in the aggregate two million four hundred thousand dollars, exclusive of the amount herein and heretofore appropriated.

Tonawanda Harbor and Niagara River, N. Y.

Improving Tonawanda Harbor and Niagara River to the north line of the village of North Tonawanda, New York: Continuing improvement, seventy-five thousand dollars.

Saugerties, N. Y., Harbor.

Improving harbor at Saugerties, New York: For maintenance, two thousand five hundred dollars.

Wilson, N. Y.

Improving harbor at Wilson, New York: Continuing improvement, two thousand five hundred dollars.

Port Chester, N. Y.

Improving Port Chester Harbor, New York: Twenty-five thousand dollars, to be expended in enlarging the channel below and up to Town Dock to a depth of twelve feet and a width of seventy feet, and from Town Dock to the steamboat dock to a depth of nine feet and a width of sixty feet.

Channel between Staten Island and New Jersey shore.

Improving channel between Staten Island and the New Jersey shore, New York and New Jersey: Completing improvement, thirty-two thousand dollars.

Huntington, N. Y.

Improving harbor at Huntington, New York: Continuing improvement, seven thousand five hundred dollars.

Port Jefferson Inlet, N. Y.

Improving harbor at Port Jefferson Inlet, New York: Continuing improvement, seven thousand five hundred dollars.

Gowanus Creek Channel, N. Y.

Improving harbor at Gowanus Creek Channel, New York: Continuing improvement, twenty-five thousand dollars.

Peekskill, N. Y.

Improving harbor at Peekskill, New York: Continuing improvement, ten thousand dollars.

Wallabout Channel, N. Y.

Improving Wallabout Channel, New York: Completing improvement in accordance with the project printed as House Document Number Fifty, Fifty-fifth Congress, third session, forty thousand dollars.

Mamaroneck, N. Y.

Improving harbor at Mamaroneck, New York: Continuing improvement, seven thousand dollars.

Pultneyville, N. Y.

Improving harbor at Pultneyville, New York: For maintenance, two thousand dollars.

Mattituck, N. Y.

Improving harbor at Mattituck, New York: Continuing improvement, five thousand dollars.

Cape Vincent, N. Y.

Improving harbor at Cape Vincent, New York, to be expended according to the approved project, or such modification thereof, not increasing the total cost, as the Secretary of War may approve, twenty-five thousand dollars, in addition to any balance on hand.

Larchmont, N. Y.

Proviso.

Plan.

Improving harbor at Larchmont, New York: For continuing improvement, fifty thousand dollars: *Provided*, That said sum, or such part thereof as may be necessary, may be used by the Secretary of War on such project under any modified plan that may hereafter be adopted by him.

Raritan Bay, N. J.

Improving harbor at Raritan Bay, New Jersey: Continuing improvement, sixty-five thousand dollars, of which forty thousand dollars may be used in dredging the channel from South Amboy to Great Beds Light.

Keyport Harbor, N. J.

Improving Keyport Harbor, New Jersey: For maintenance, two thousand five hundred dollars.

Erie, Pa.

Improving harbor at Erie, Pennsylvania: Continuing improvement, one hundred and twenty-five thousand dollars, to be expended in accordance with the project printed in House Document Numbered Seventy, Fifty-fifth Congress, first session, or such modification thereof, not increasing the total cost, as the Secretary of War may approve.

Pittsburg, Pa.

Improving harbor at Pittsburg, Pennsylvania: Completing improvement in accordance with the report of the Chief of Engineers, dated December sixth, eighteen hundred and ninety-seven, one hundred and ten thousand six hundred and sixty-two dollars and ninety cents.

Wilmington and Christiana River, Del.

Contracts.

Improving harbor at Wilmington and Christiana River, Delaware: Continuing improvement, forty-five thousand dollars, of which amount twenty thousand dollars, or so much thereof as may be necessary, shall be used for maintenance, and the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to complete the project of improvement, in accordance with the project submitted by the Board of Engineers, in its report of October third, eighteen hundred and ninety-six, and including the removal of rock from the channel as recommended in the Annual Report of the Chief of Engineers for eighteen hundred and ninety-seven, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and five thousand seven hundred and eighty dollars, exclusive of the amount herein and heretofore appropriated, that being the amount reported by the Chief of Engineers as necessary to complete said project.

Cape Charles City, Va.

Improving harbor at Cape Charles City, Virginia: Continuing improvement, twenty thousand dollars.

Milford Haven, Va.

Improving harbor at Milford Haven, Virginia: Completing improvement in accordance with the project printed in House Document Number Two hundred and ninety-nine, Fifty-third Congress, third session, twelve thousand five hundred dollars.

Cape Lookout, N. C.

Board to survey, etc.

Harbor of refuge, Cape Lookout, North Carolina: The Secretary of War is hereby authorized to appoint a board of three army engineers to make examination, survey, plan, and estimate for a harbor of refuge at or near Cape Lookout, North Carolina; and five thousand dollars is hereby appropriated to pay the cost of the same.

Charleston, S.C.

Contracts.

Improving Charleston Harbor, South Carolina, in accordance with the project of November eighteenth, eighteen hundred and ninety-eight, as modified and approved by the division engineer: The Secretary of War may enter into a contract or contracts for materials and work necessary to carry on the said project, to be paid for as appropriations may from time to time be made by law, not exceeding in the aggregate one hundred and seventy five thousand dollars, exclusive of the amount heretofore appropriated and now on hand, and a suitable dredge may be purchased or constructed for the prosecution of said work, to cost not more than one hundred and fifty thousand dollars, to be paid for from amounts now on hand or herein authorized to be expended.

Dredge.

Brunswick, Ga. Outer bar.

Vol. 28, p. 342. Vol. 29, p. 208.

Improving the outer bar, Brunswick, Georgia: C. P. Goodyear, the contractor with the Government of the United States to deepen the outer bar of Brunswick, Georgia, under the river and harbor Acts of eighteen hundred and ninety-four and eighteen hundred and ninety-six, shall be entitled to receive the sums appropriated by said Acts for obtaining a channel twenty-four feet deep and two hundred feet wide, and a channel twenty-five feet deep and one hundred feet wide, provided the same are obtained on or before June third, nineteen hundred, and said Acts are hereby amended accordingly. After the expiration of the time herein stated within which said work of improvement must be obtained, the Secretary of War shall cause a survey of the same to be made, and report a plan, with estimate of the cost thereof, with a view to obtaining a depth of twenty-six feet at mean high tide, with a width of two hundred feet; and the sum of five thousand dollars, or so much thereof as may be necessary, is hereby appropriated to defray the cost of making said survey, and estimate based thereon.

Survey, etc.

—Inner harbor.

Improving inner harbor at Brunswick, Georgia: For maintenance, ten thousand dollars.

Savannah, Ga.

Vol. 29, p. 208, amended.

Improving harbor at Savannah, Georgia: For maintenance, fifty thousand dollars. And the Act making appropriations for the construction, repair, and preservation of public works on rivers and harbors, and for other purposes, passed June third, eighteen hundred and ninety-six, is hereby amended to permit the Secretary of War to construct the steamboat channel between Beaufort, South Carolina, and Savannah, Georgia, by way of route numbered one, instead of by way of route numbered two, as required by the said Act.

Steamboat channel from Beaufort, S. C.

Darien, Ga.

Improving harbor at Darien, Georgia: Continuing improvement, ten thousand dollars.

Doboy Bar, Ga.

Improving Doboy Bar, Georgia, in accordance with plan presented in House Document, Number Thirteen, Fifty-fifth Congress, first session, seventy thousand dollars.

Apalachicola Bay, Fla.

Improving harbor at Apalachicola Bay, Florida, in accordance with the project printed in the Annual Report of the Chief of Engineers for eighteen hundred and ninety-seven, pages sixteen hundred and fifty-five and those that follow, and for maintenance, twenty thousand dollars.

Pensacola, Fla.

Improving harbor at Pensacola, Florida: Continuing improvement and for maintenance, seventy thousand dollars; the same to be used toward securing a channel depth of thirty feet at mean low water, from the Gulf of Mexico to the dock line at the east end of the city of Pensacola.

Biscayne Bay, Fla.
Board on proposed channel.

Biscayne Bay, Florida: The Secretary of War shall appoint a board of three engineers to examine and report upon the respective routes from Miami to the sea by Norris Cut, Bear Cut, and Cape Florida Entrance, respectively, with reference to the most feasible route and the cost of providing a channel eighteen feet in depth and suitable width, with a view to ascertaining the desirability of improving the same; and to pay the expense of said board the sum of five thousand dollars, or so much thereof as may be necessary, is hereby appropriated.

Key West, Fla.

Improving entrance to harbor at Key West, Florida: Continuing improvement, twenty-five thousand dollars.

Charlotte Harbor and Pease Creek, Fla.

Improving Charlotte Harbor and Pease Creek, Florida: Completing improvement, twenty-five thousand dollars.

Carrabelle Bar, Fla.

Improving Carrabelle Bar and Harbor, Florida: Continuing improvement, ten thousand dollars.

Tampa Bay, Fla.
Proviso.
Contracts.

Improving Tampa Bay, Florida: For improvement of Tampa Bay, Florida, from its entrance into the Gulf of Mexico to Port Tampa, seventy-five thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary toward securing a channel depth of twenty-seven feet from said Gulf of Mexico to Port Tampa, and of a width five hundred feet across the bar and three hundred feet in the bay, as proposed in the report of November fourteenth, eighteen hundred and ninety-eight, published in House Document Number Fifty-two, Fifty-fifth Congress, third session, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate six hundred and seventy-five thousand dollars, exclusive of the amount herein appropriated.

Hillsboro Bay, Fla.

Improving Hillsboro Bay, Florida, in accordance with project printed in House Document Number Five hundred and forty-five, Fifty-fifth Congress, second session, one hundred and twenty-five thousand dollars.

Mobile, Ala.
Proviso.
Contracts.

Improving harbor at Mobile, Alabama: Continuing improvement, one hundred thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary, with the view of ultimately securing a channel twenty-three feet deep and one hundred feet wide at the bottom, with appropriate slope, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate five hundred thousand dollars, exclusive of the amount herein and heretofore appropriated.

Ship Island Pass, Miss.

Ship Island Pass, Mississippi: To complete dredging a channel through Ship Island Pass, with a depth of twenty-six feet, in accordance with the report and estimate printed in House Document Number One hundred and twenty, Fifty-fifth Congress, third session, forty thousand dollars.

Gulfport, Miss.
Contracts.
Channel and anchorage basin.

Gulfport, Mississippi, to Ship Island Harbor: The Secretary of War is hereby authorized to enter into a contract or contracts to dredge a channel three hundred feet wide and nineteen feet deep at mean low water from the anchorage at Ship Island Harbor, on the Gulf of Mexico, to Gulfport, in Harrison County, in the State of Mississippi, and to construct at the end of said channel next the shore an anchorage basin of similar depth not less than two thousand six hundred and forty feet by one thousand three hundred and twenty feet in area, at a cost not to exceed one hundred and fifty thousand dollars; and the Secretary of War is further authorized to contract for the maintenance of said channel and anchorage basin for the term of five years after its completion, for the sum of ten thousand dollars annually: *Provided*, That the necessary expenses for such examinations, surveys, and inspections of the work as may be required from time to time to determine whether the channel and anchorage basin are dredged and maintained as required by this Act, shall be paid from the permanent indefinite appropriation made by section four of the river and harbor Act approved July fifth, eighteen hundred and eighty-four: *And provided further*, That the depths provided for shall be at mean low water as determined by the engineer officer in local charge of work.

Provisos.
Expenses, surveys, etc.
Vol. 23, p. 147.

Depths.

Improving mouth and passes of Calcasieu River, Louisiana: Continuing improvement, thirty-five thousand dollars.

Calcasieu River, La.

Improving outlet of the Mississippi River by constructing a sill across Pass a Loutre and by constructing and operating two dredges, two hundred thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to carry on such improvements, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three hundred thousand dollars, exclusive of the amount herein appropriated. A board of four engineers shall be appointed by the President, of whom at least two shall be from civil life, who shall prepare and report, as soon as conveniently may be done, a project for securing a navigable channel of suitable width and of thirty-five feet depth at mean low water of the Gulf of Mexico throughout the Southwest Pass of the Mississippi River; said board of engineers shall submit detailed estimates of the cost of each and every feature of the project, and they shall report especially whether it is necessary to construct inner jetties; and if. in their judgment, inner jetties should be constructed, they shall provide for the location of the same, so as to involve the least cost consistent with the safety and efficiency of the work hereby contemplated. The sum of twenty thousand dollars, or so much thereof as may be necessary, is hereby appropriated to defray the cost of said board and of the preparation of said project.

Improving outlet Mississippi River, Pass a Loutre.

Proviso.
Contracts.

Board to report on channel through Southwest Pass.

Improving entrance to Galveston Harbor, Texas: For maintenance, fifty thousand dollars.

Galveston, Tex.

Improving Galveston Ship Channel and Buffalo Bayou, Texas: For improvement of the Galveston Ship Channel and Buffalo Bayou, by dredging or otherwise, from the jetties at Galveston, Texas, up through the present ship channel and Buffalo Bayou to the proposed harbor site at Houston, Texas, to be provided by the citizens of Houston, three hundred thousand dollars: *Provided*, That out of said sum a suitable dredge may be constructed for said work.

Galveston Ship Channel and Buffalo Bayou, Texas.

Proviso.
Dredge.

Water route from Galveston to Houston, Tex.

Provisos.
Contracts.

Dredges.

For commencing the improvement of the water route from the mouth of the jetties at Galveston, through the existing ship channel and up Buffalo Bayou to Houston, Texas, including harbor at Houston, in accordance with project submitted by the Board of Engineers in report of survey dated November third, eighteen hundred and ninety-seven, two hundred and fifty thousand dollars: *Provided*, That contracts may be entered into by the Secretary of War for the whole or any part of such materials and work as may be required for prosecuting said improvement, or the said materials may be purchased and the work done otherwise than by contract, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million dollars: *Provided further*, That out of said sum two dredges may be constructed for said work.

Brazos River, Tex.

Proviso.
Transfer of rights, etc., by Brazos River Channel and Dock Company.

Vol. 25, p. 444.

Examination of river.

Mouth of Brazos River, Texas: For dredging, and such other work as may be deemed most effective in the judgment of the Secretary of War in improving and developing the harbor, eighty-five thousand dollars: *Provided*, That no part of said sum shall be expended until the Brazos River Channel and Dock Company shall file with the Secretary of War a transfer to the United States of the jetties, and auxiliary works; also a release of all rights and privileges conferred upon said company by its charter or by the Act of Congress approved August ninth, eighteen hundred and eighty-eight, to charge or collect tolls for the use and navigation of said river; and the Secretary of War is directed to have an examination made of the mouth of the Brazos and the jetties, and report to Congress the estimated cost of extending the jetties one-half mile, and the estimated depth and width of the channel to be obtained by such extension, and the estimated cost of obtaining twenty feet of water and a channel one hundred and fifty feet wide.

Deepening channel from Galveston Harbor to Texas City.
Contracts.

Deepening the channel from Galveston Harbor to Texas City, Texas: The Secretary of War is hereby authorized to enter into a contract or contracts for deepening the present channel north of Pelican Island from Galveston Harbor to Texas City, Texas, to a depth of twenty-five feet and one hundred feet wide at the bottom, at a cost not to exceed two hundred and fifty thousand dollars, of which amount one hundred thousand dollars shall be paid whenever it shall satisfactorily appear to the Secretary of War, through army engineers, that said channel has been deepened to a depth of twenty-one feet, and the remainder of the price shall be paid when the whole work has been completed in a manner satisfactory to the Secretary of War.

Aransas Pass, Tex.

Provisos.
Removal of old Government jetty in harbor.

Surrender of rights by Aransas Pass Harbor Company.

Improving Aransas Pass, Texas: For dredging and other improvement of Aransas Pass Harbor, sixty thousand dollars: *Provided*, That the Secretary of War is hereby authorized to contract for the removal of that portion of the old Government jetty in said harbor from the end nearest the curved jetty constructed by the Aransas Pass Harbor Company to the wreck Mary, in such manner as to in no wise interfere with the curved jetty now located in said harbor: *And provided further*, That said contract shall not be let by the Secretary of War, nor said work done, until the said Aransas Pass Harbor Company shall have properly released and surrendered all rights and privileges heretofore granted to it in said harbor by Congress, also the jetty constructed in said harbor.

Sabine Pass, Texas and Louisiana.

Sabine Pass, Texas and Louisiana: For straightening, widening, and otherwise improving the main ship channel, Sabine Pass, Texas and Louisiana, by the removal of the oyster reefs, mud flats, and other material between a point one thousand feet north of the United States life-saving station and a point opposite the United States light-house, one hundred and fifty thousand dollars.

Corpus Christi and Padre Island Harbor, Tex.
Vol. 26, p. 741.
Vol. 27, p. 422.
Time extended for commencing construction.

Corpus Christi and Padre Island Harbor, Texas: Section two of "An Act to promote the construction of a safe deep-water harbor on the coast of Texas," approved February ninth, eighteen hundred and ninety-one, and as amended January twenty-third, eighteen hundred and ninety-three, is hereby amended so as to extend the time to locate and commence the construction of the said Corpus Christi and Padre Island Harbor, off Padre Island, on the coast of Texas, two years from February ninth, eighteen hundred and ninety-nine.

Ashtabula, Ohio.
Proviso.
Contracts.

Improving harbor at Ashtabula, Ohio: Continuing improvement, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the present project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate four hundred and thirty thousand dollars, exclusive of the amount herein and heretofore appropriated.

Black River (Lorain), Ohio.
Proviso.
Contracts.

Improving harbor at Black River (Lorain), Ohio: Continuing improvement, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the project designated as Plan B, in the report dated November first, eighteen hundred and ninety-seven, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate six hundred thousand dollars, exclusive of the amount herein and heretofore appropriated.

Cleveland, Ohio.

Improving harbor at Cleveland, Ohio, according to the report of January tenth, eighteen hundred and ninety-nine, seventy-five thousand dollars, of which amount such sum as may be necessary may be used in dredging between the Government piers.

Conneaut, Ohio.

Improving harbor at Conneaut, Ohio: Continuing improvement, one hundred thousand dollars.

Fairport, Ohio.

Improving harbor at Fairport, Ohio: Continuing improvement, one hundred thousand dollars.

Huron, Ohio

Improving harbor at Huron, Ohio: Continuing improvement, twenty-five thousand dollars.

Sandusky, Ohio.

Improving harbor at Sandusky, Ohio: Continuing improvement in accordance with plans submitted February twenty-eighth, eighteen hundred and ninety-eight, eighty thousand dollars.

Port Clinton, Ohio.

Improving harbor at Port Clinton, Ohio: Continuing improvement, six thousand dollars.

Toledo, Ohio.

Proviso. Contracts.

Improving harbor at Toledo, Ohio, by providing a straight channel through Maumee River and Bay four hundred feet in width and twenty-one feet deep, in accordance with the project dated December sixteenth, eighteen hundred and ninety-seven, one hundred and fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the said project, to be paid for as appropriations may from time to time be made by law, not to exceed eight hundred thousand dollars, exclusive of the amount herein and heretofore appropriated.

Michican City, Ind. Outer harbor.

Proviso. Contracts.

Improving outer harbor at Michican City, Indiana: The Secretary of War may, in his discretion, modify the existing project in accordance with the recommendations contained in the report of the Board of Engineers under date of March sixth, eighteen hundred and ninety-seven, and expend the balance on hand from previous appropriations to the improvement of said harbor according to the project so modified: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and ninety-five thousand dollars, exclusive of the amount herein and heretofore appropriated.

— inner harbor.

Improving inner harbor at Michigan City, Indiana: Continuing improvement, seven thousand five hundred dollars.

Waukegan, Ill.

Improving harbor at Waukegan, Illinois: For maintenance, five thousand five hundred dollars.

Chicago, Ill.

Improving Chicago Harbor, Illinois: Continuing improvement, one hundred thousand dollars, to be expended in accordance with the project submitted by the Secretary of War as set forth in the report of Major W. L. Marshall of July sixteenth, eighteen hundred and ninety-seven.

Calumet, Ill.

Proviso. Contracts.

Improving Calumet Harbor, Illinois, according to the project of February twenty-first, eighteen hundred and ninety-six: Continuing improvement, one hundred and fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate eight hundred and fifty-nine thousand eight hundred and thirty dollars, exclusive of the amount herein and heretofore appropriated.

Charlevoix and Pine Lake, Mich.

Improving harbor at Charlevoix and entrance to Pine Lake, Michigan: Continuing improvement, fifteen thousand dollars.

Frankfort, Mich.

Improving harbor at Frankfort, Michigan: Continuing improvement, thirty-five thousand dollars.

Grand Haven, Mich.

Improving harbor at Grand Haven, Michigan: Continuing improvement, ten thousand dollars.

Grand Marais, Mich.

Improving harbor of refuge at Grand Marais, Michigan: Continuing improvement, twenty-five thousand dollars.

Manistee, Mich.

Improving harbor at Manistee, Michigan: Continuing improvement, twenty thousand dollars.

Improving harbor at Holland (Black Lake), Michigan, in accordance with the report and plans submitted in House Document Number Two hundred and seventy-two, Fifty-fourth Congress, second session, thirty-seven thousand five hundred dollars.

Holland (Black Lake), Mich.

Improving harbor at Monroe, Michigan: Continuing improvement by dredging channel, five thousand dollars.

Monroe, Mich.

Improving harbor at Muskegon, Michigan: Continuing improvement, sixty thousand dollars: *Provided*, That any portion of the above sum may be used at the discretion of the Secretary of War, in sheet piling or otherwise, to prevent erosion and preserve the channel at any point where it may be necessary between Lake Michigan and Muskegon Lake.

Muskegon, Mich.
Proviso.
Preventing erosion.

Improving harbor at Pentwater, Michigan: Continuing improvement, twenty five thousand dollars.

Pentwater, Mich.

Improving harbor of refuge, Portage Lake, Michigan: Continuing improvement, seventy-five thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to complete the present project for said harbor of refuge, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate eighty-five thousand dollars, exclusive of the amount herein and heretofore appropriated.

Portage Lake, Mich.
Proviso.
Contracts.

Improving harbor of refuge at Sand Beach, Michigan, fifty thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to repair such harbor of refuge in accordance with the recommendation of the Chief of Engineers, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred thousand dollars, exclusive of the amounts herein and heretofore appropriated.

Sand Beach, Mich.
Proviso.
Contracts.

Improving harbor at Saint Joseph, Michigan, in accordance with the modified project as printed in House Document Number Three hundred and seven, Fifty-fifth Congress, second session, fifty thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to complete such harbor in accordance with said modified project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three hundred and thirty thousand dollars, exclusive of the amounts herein and heretofore appropriated.

St. Joseph, Mich.
Proviso.
Contracts.

Improving harbor at South Haven, Michigan: Completing improvement, forty-five thousand dollars.

South Haven, Mich.

Improving harbor at White Lake, Michigan: For maintenance and continuing improvement, thirty-five thousand dollars.

White Lake, Mich.

Improving harbor at Marquette, Michigan: Continuing improvement, twenty-five thousand dollars.

Marquette, Mich.

Improving harbor at Ludington, Michigan, in accordance with the report and plan submitted in House Document Number Two hundred and seventy-three, Fifty-fourth Congress, second session, twenty-five thousand dollars.

Ludington, Mich.

Petoskey, Mich. Improving harbor at Petoskey, Michigan: Continuing improvement, twenty thousand dollars.

Saugatuck, Mich. Improving harbor at Saugatuck, Michigan: Continuing improvement, seven thousand dollars.

Menominee, Mich. and Wis. Improving harbor at Menominee, Michigan and Wisconsin: For maintenance, five thousand five hundred dollars.

Cheboygan, Mich. Improving harbor at Cheboygan, Michigan: Continuing improvement, eight thousand dollars.

Presque Ile Point, Mich. Improving harbor at Presque Ile Point, Marquette Bay, Michigan: Completing improvement, thirty thousand dollars.

Ahnapee, Wis. Improving harbor at Ahnapee, Wisconsin: Continuing improvement according to Plan A, submitted under date of December thirty-first, eighteen hundred and ninety-six, thirteen thousand dollars.

Green Bay, Wis. Improving harbor at Green Bay, Wisconsin: Continuing improvement, twenty-eight thousand six hundred dollars.

Kenosha, Wis. Improving harbor at Kenosha, Wisconsin, according to the project dated January twelfth, eighteen hundred and ninety-nine, and the project for deepening the basin and widening and deepening said harbor, based upon the removal of the present north pier, dated January twenty-sixth, eighteen hundred and ninety-seven, fifty thousand dollars, of which three thousand dollars may be used for maintenance: *Proviso.* Contracts. *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the said projects, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate the sum of one hundred and forty-one thousand dollars, exclusive of the amount herein and heretofore appropriated.

Kewaunee, Wis. Improving harbor at Kewaunee, Wisconsin: For maintenance, eight thousand eight hundred dollars.

Milwaukee, Wis., harbor of refuge. Improving harbor of refuge at Milwaukee, Wisconsin: Continuing improvement, fifty thousand dollars: *Provided*, *Proviso.* Contracts. That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the present project for said harbor of refuge, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate the sum of one hundred and five thousand six hundred and fifty dollars, exclusive of the amount herein and heretofore appropriated.

—harbor. Improving harbor at Milwaukee, Wisconsin: For maintenance, fourteen thousand dollars; for deepening the channel at the entrance in accordance with the project submitted November twenty-third, eighteen hundred and ninety-six, twelve thousand dollars.

Port Washington, Wis. Improving harbor at Port Washington, Wisconsin: For maintenance, four thousand four hundred dollars.

Racine, Wis. Improving harbor at Racine, Wisconsin, according to the project reported January twelfth, eighteen hundred and ninety-nine, and the project for widening and deepening said harbor and correcting the funnel-shaped entrance thereof, reported January twenty-seventh, eighteen hundred and ninety-seven, fifty thousand dollars: *Provided*, *Proviso.* Contracts. That a contract or contracts may be entered into by the

Secretary of War for such materials and work as may be necessary to complete said projects, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate sixty-seven thousand six hundred and fifty dollars, exclusive of the amount herein and heretofore appropriated, of which three thousand dollars may be used for maintenance.

Sheboygan, Wis.

Improving harbor at Sheboygan, Wisconsin: For maintenance, three thousand four hundred dollars; for improving said harbor according to the project for a breakwater reported July twenty-sixth, eighteen hundred and ninety-eight, twenty-five thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate the sum of fifty-two thousand dollars, exclusive of the amount herein and heretofore appropriated.

Proviso.
Contracts.

Ashland, Wis.

Improving harbor at Ashland, Wisconsin: Continuing improvement, thirty-five thousand dollars, of which so much as shall be necessary may, in the discretion of the Secretary of War, be expended in completing the shore end of the breakwater, now partly constructed, and connecting it with the land.

Two Rivers, Wis.

Improving harbor at Two Rivers, Wisconsin: For maintenance, eight thousand dollars.

Sturgeon Bay Canal harbor of refuge.

Improving Sturgeon Bay Canal, harbor of refuge: For maintenance of channel and piers, five thousand five hundred dollars.

Oconto, Wis.

Improving harbor at Oconto, Wisconsin: Continuing improvement and maintenance, fifteen thousand dollars.

Sturgeon Bay and Lake Michigan Ship Canal.

Improving Sturgeon Bay and Lake Michigan Ship Canal: Continuing improvement, thirty thousand dollars.

Manitowoc, Wis.

Improving harbor at Manitowoc, Wisconsin: For maintenance, three thousand three hundred dollars.

La Crosse, Wis.

Completing harbor at La Crosse, Wisconsin: Continuing improvement according to the project reported January eleventh, eighteen hundred and ninety-seven, twelve thousand dollars, exclusive of five thousand dollars appropriated by river and harbor Act of June third, eighteen hundred and ninety-six: *Provided*, That no expenditure shall be made for such purpose by the United States until the city of La Crosse shall have taken the necessary steps to carry the sewers across the area to be filled in, so as to discharge outside of the bulkhead proposed in said project.

Vol. 29, p. 242.

Proviso.
Condition of expenditure.

Grand Marais, Minn.

Improving harbor at Grand Marais, Minnesota: Completing improvement, thirty thousand dollars.

Agate Bay, Minn.

Improving harbor at Agate Bay, Minnesota: Completing improvement, seventy-one thousand seven hundred and eight dollars.

Alviso, Cal.

Improving Alviso Harbor, Santa Clara County, California, in accordance with project reported December eleventh, eighteen hundred and ninety-six, forty-eight thousand dollars.

San Diego, Cal.

Improving harbor at San Diego, California: Continuing improvement, sixty-five thousand dollars.

San Luis Obispo, Cal.

Improving harbor at San Luis Obispo, California: Continuing improvement, fifty-five thousand dollars.

Humboldt, Cal.

Improving harbor at Humboldt, California: Continuing improvement, by dredging in the inner harbor, fifty thousand dollars.

San Francisco, Cal.

Proviso.
Contracts.

Improving San Francisco Harbor, California: By removing Arch Rock and Shag Rocks Numbered One and Two, all to a depth of thirty feet below mean low water, according to the report made October thirteenth, eighteen hundred and ninety-seven, one hundred thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for the materials and work necessary for the completion of said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate five hundred thousand dollars, exclusive of the amount herein appropriated.

Yaquina Bay, Oreg.
Board to investigate proposed improvement.
Vol. 29, p. 214.

Yaquina Bay, Oregon: The Secretary of War is hereby authorized to appoint a board of three engineers, who shall make examination thereof, with a view to ascertaining the desirability of prosecuting the work authorized by the river and harbor Act of eighteen hundred and ninety-six, for such modification thereof as, in the judgment of said board may be desirable for the commerce of said bay, together with an estimate of the cost of such work, and until such report shall have been made and acted upon by Congress, no further action shall be taken by the Secretary of War in pursuance of existing law, and five thousand dollars, or so much thereof as may be necessary, is hereby appropriated to pay the expenses of such examination.

Tillamook Bay and Bar, Oreg.

Improving Tillamook Bay and Bar, Oregon: Continuing improvement, twenty-five thousand dollars.

Siuslaw River, Oreg.

Mouth of Siuslaw River, Oregon: Continuing improvement, thirty thousand dollars.

Coos Bay, Oreg.

Improving entrance to Coos Bay and Harbor, Oregon: Continuing improvement, one hundred and fifty thousand dollars.

Olympia, Wash.

Improving Olympia Harbor, Washington: Continuing improvement, fifteen thousand dollars.

Everett, Wash.
Proviso.
Contracts.

Improving Everett Harbor, Washington: Continuing improvement, fifty thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for the materials and work necessary for the completion of said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three hundred and forty-two thousand dollars, exclusive of the amount herein and heretofore appropriated.

Pearl Harbor, Hawaii.

Improving Pearl Harbor, Hawaii, in accordance with the report submitted by Rear-Admiral Walker, July eleventh, eighteen hundred and ninety-four, and contained in Senate Executive Document Number Forty-two, Fifty-third Congress, third session: Completing improvement, one hundred thousand dollars.

Rivers.
Bagaduce River, Me.

Improving Bagaduce River, Maine: Continuing improvement, three thousand dollars.

Penobscot River, Me.

Improving Penobscot River, Maine, in accordance with the project submitted May third, eighteen hundred and ninety-seven: Completing improvement, twenty-eight thousand dollars.

Narraguagus River, Me.

Improving Narraguagus River, Maine: Completing improvement, five thousand dollars.

Lubec Channel, Me.

Improving Lubec Channel, Maine: Continuing improvement, twenty-five thousand dollars.

Georges River, Me.

Improving Georges River, Maine: Continuing improvement, ten thousand dollars.

Union River, Me.

Proviso.

Contracts.

Improving Union River, Maine: Continuing improvement, fifteen thousand dollars: *Provided*, That the Secretary of War may enter into contract or contracts for such material and work as may be necessary to complete the present project, to be paid for as appropriations may from time to time be made by law, not exceeding in the aggregate one hundred and fifteen thousand dollars, exclusive of the amount herein and heretofore appropriated.

Saco River, Me.

Improving Saco River, Maine, including breakwater, five thousand dollars.

Cocheco River, N. H.

Improving Cocheco River, New Hampshire: Continuing improvement, twenty thousand dollars.

Exeter River, N. H.

Improving Exeter River, New Hampshire, in accordance with project submitted May third, eighteen hundred and ninety-seven: Completing improvement, twelve thousand dollars.

Otter Creek, Vt.

Improving Otter Creek, Vermont: Continuing improvement, one thousand dollars.

Lake Champlain Narrows.

Improving the Narrows of Lake Champlain, Vermont: Continuing improvement, five thousand dollars.

Powow River, Mass.

Improving Powow River, Massachusetts: Continuing improvement, twelve thousand dollars.

Taunton River, Mass.

Improving Taunton River, Massachusetts: Completing improvement, seven thousand dollars.

Weymouth River, Mass.

Improving Weymouth River, Massachusetts: Continuing improvement, ten thousand dollars.

Essex River, Mass.

Improving Essex River, Massachusetts: Completing improvement, ten thousand dollars.

Mystic and Malden rivers, Mass.

Improving Mystic and Malden rivers, Massachusetts: Continuing improvement, five thousand dollars.

Mystic River, Mass.—below Island End River.

Improving Mystic River, Massachusetts, below the mouth of Island End River, fifty thousand dollars, according to the project printed in House Document Number One hundred and seventy-eight, Fifty-fifth Congress, third session.

Town River, Mass.

Improving Town River, Massachusetts: Continuing improvement, eight thousand dollars.

Merrimac River, Mass.

Improving Merrimac River, Massachusetts: Continuing improvement in accordance with the project submitted May fifth, eighteen hundred and ninety-seven, forty thousand dollars.

Pawtucket River, R. I.

Proviso.

Straightening channel.

Improving Pawtucket River, Rhode Island: Continuing improvement, thirty thousand dollars: *Provided*, That so much of this sum as may be deemed necessary by the engineer in charge may be used in straightening the channel between the mouth of Ten Mile River and Bucklins Island.

Connecticut River.

Improving Connecticut River below Hartford, Connecticut: Continuing improvement, twenty thousand dollars.

Housatonic River, Conn.

Improving Housatonic River, Connecticut: Continuing improvement, fifteen thousand dollars.

Mystic River, Conn.

Improving Mystic River, Connecticut: Completing improvement, nine thousand six hundred dollars.

Thames River, Conn.

Provisos.

Norwich, Conn., increased depth.

Survey directed at New London, Conn.

Improving Thames River, Connecticut: Continuing improvement, twenty thousand dollars: *Provided*, That a part of this appropriation may, in the discretion of the Secretary of War, be used to secure depth of water for anchorage purposes at Norwich, west of Norwich docks: *Provided further*, That out of this appropriation the Secretary of War is directed to cause a survey and estimate of the cost of improvement to be made with a view to improving the harbor at New London, Connecticut, to meet the demands of commerce at that port.

Pawcatuck River, R. I. and Conn.

Improving Pawcatuck River, Rhode Island and Connecticut: Continuing improvement, fifteen thousand dollars.

Sakonnet River, R. I.

Sakonnet River, Rhode Island: Completing improvement, twenty thousand dollars, with authority to use the unexpended balance.

Hudson River, N. Y.

Proviso.

Contracts.

Improving Hudson River, New York: Continuing improvement, one hundred thousand dollars; and the Secretary of War may make such changes in the project for location and width of channel at and near Troy as in his opinion the interests of navigation may require: *Provided*, That contracts may be entered into by the Secretary of War for such materials and labor as may be required for prosecuting such improvement according to approved project, not to exceed in the aggregate five hundred thousand dollars exclusive of the amount herein and heretofore appropriated, to be paid for as appropriations may from time to time be made by law.

Harlem River, N. Y. —use of unused stone, etc.

Improving Harlem River, New York: Continuing improvement, one hundred thousand dollars. And the Secretary of War is authorized and directed to take such action as may be most advantageous to the United States regarding the unused stone originally excavated for this improvement and now stored on leased ground known as Dyckmans Meadows, and so much of the appropriation herein made as may be necessary may be used for such purpose.

East River and Hell Gate, N. Y.

Improving East River and Hell Gate, New York: Continuing improvement, including the removal of Man of War Rock, two hundred and fifty thousand dollars.

Browns Creek, Sayville, L. I., N. Y.

Improving Browns Creek, Sayville, Long Island, New York: Continuing improvement and for maintenance, three thousand dollars.

St. Lawrence River, N. Y., improving shoals.

Improving shoals between Sister Islands and Cross Over light, Saint Lawrence River, New York: Continuing improvement, twenty thousand dollars, to be expended for improving shoals between Sister Islands and Cross-Over light and in the Saint Lawrence River between Ogdensburg and the foot of Lake Ontario.

Niagara River.

Improving Niagara River from Tonawanda to Port Day: Continuing improvement, fifteen thousand dollars.

Bronx River, N. Y.

Improving Bronx River, New York: Continuing improvement, twenty thousand dollars.

Passaic River, N. J.

Improving Passaic River, New Jersey: Continuing improvement, fifteen thousand dollars.

Raritan River, N. J.

Improving Raritan River, New Jersey: Continuing improvement, twenty thousand dollars.

Shrewsbury River, N. J.

Improving Shrewsbury River, New Jersey: For maintenance, ten thousand dollars.

South River, N. J.

Improving South River, New Jersey: Continuing improvement, five thousand dollars.

Alloway Creek, N. J.

Improving Alloway Creek, New Jersey: Continuing improvement, three thousand dollars.

Mattawan Creek, N. J.

Improving Mattawan Creek, New Jersey: For maintenance, three thousand dollars.

Shoal Harbor and Compton Creek, N. J.

Improving Shoal Harbor and Compton Creek, New Jersey: Continuing improvement, eight thousand dollars; which sum shall be expended for extending the improved channel farther toward the five-foot contour of Raritan Bay.

Goshen Creek, N. J.

Improving Goshen Creek, New Jersey: Completing improvement, eight thousand dollars.

Manasquan River, N. J.

Improving Manasquan River, New Jersey: Continuing improvement, five thousand dollars.

Rancocas River, N. J.

Improving Rancocas River, New Jersey: Continuing improvement, two thousand dollars, to be expended in the Lumberton branch thereof.

Mantua Creek, N. J.

Proviso. Amount available for rights of way, etc.

Improving Mantua Creek, New Jersey, in accordance with the project presented in House Document Number One hundred and twenty-three, Fifty-fifth Congress, second session, twenty-five thousand dollars: *Provided*, That no part of any money appropriated for this project in excess of eight thousand dollars shall be expended for right of way privileges, easements, or other rights above the phosphate works and below Paulsboro, and no part thereof shall be expended for any such purpose unless all such rights are secured for an amount not in excess of said sum of eight thousand dollars.

Allegheny River, Pa.

Improving Allegheny River, Pennsylvania: Continuing improvement, fifteen thousand dollars.

Delaware River, from Trenton, etc.

—improvement, Philadelphia.

Provisos. Limit of cost. Contracts.

Board to examine project.

Improving Delaware River from Trenton to its mouth, Pennsylvania and New Jersey: Continuing improvement, three hundred thousand dollars, of which the Secretary of War may use so much as may, in his opinion, be required between Trenton and Christian street in Philadelphia, and the balance shall be available for obtaining a channel six hundred feet wide and thirty feet deep from said Christian street to deep water in Delaware Bay, in accordance with the report printed in House Document Number Two hundred and nineteen, Fifty-fifth Congress, second session, or such modified project as shall hereafter be recommended by a board of engineers and approved by the Secretary of War: *Provided*, That the total cost of the work shall not be increased thereby: *And provided further*, That the Secretary of War may enter into contract or contracts for such materials and work as may be required for prosecuting such improvement, not to exceed in the aggregate five hundred thousand dollars, to be paid for as appropriations may from time to time be made by law. The Secretary of War is hereby authorized to appoint a board of three engineers to make a further examination of the project and report such modification of the same as may be deemed desirable, with an estimate of the cost, the expense of such examination to be paid from the appropriation herein made.

Monongahela River.
Lock Six.
Above Lock Three.
Repair steamer, etc.
Proviso.
Contracts.

Improving Monongahela River: For the enlargement and improvement of Lock Six on the Monongahela River, and for extension of existing fender and mooring crib three hundred linear feet above Lock Three, and building a deflecting dike one thousand eight hundred feet above said lock on said river, and for a new repair steamer with snagging appliances, and for a new dredge boat and two dump scows, fifty thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for the completion of said work and the purchase or construction of said boats, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and thirty-five thousand five hundred and fifty-six dollars, exclusive of the amount herein appropriated.

Appoquinimink River, Del.

Improving Appoquinimink River, Delaware: Continuing improvement, five thousand dollars.

Smyrna River, Del.

Improving Smyrna River, Delaware: Continuing improvement, five thousand dollars.

Murderkill River, Del.

Improving Murderkill River, Delaware: Continuing improvement, five thousand dollars.

Broad Creek River, Del.

Improving Broad Creek River, Delaware: Completing improvement, five thousand dollars.

Mispillion River, Del.

Improving Mispillion River, Delaware: Completing improvement and for maintenance, two thousand five hundred dollars.

Nanticoke River, Del. and Md.

Improving Nanticoke River, Delaware and Maryland: Continuing improvement, three thousand dollars.

Choptank River, Md.

Improving Choptank River, Maryland: Continuing improvement, eight thousand dollars.

Chester River, Md.

Improving Chester River, Maryland: Completing improvement, three thousand two hundred dollars.

Manokin River, Md.

Improving Manokin River, Maryland: Continuing improvement, one thousand five hundred dollars.

Warwick River, Md.

Improving Warwick River, Maryland: Continuing improvement, two thousand dollars.

Patapsco River to Baltimore.
Contracts.

Improving Patapsco River and channel to Baltimore: Continuing improvement, two hundred thousand dollars, for the purpose of obtaining a channel thirty feet in depth, in accordance with the project submitted December first, eighteen hundred and ninety-four, as amended by the report of December third, eighteen hundred and ninety-six; and the Secretary of War may enter into contracts for such material and labor as may be required for prosecuting such improvement, not to exceed in the aggregate one million dollars, to be paid for as appropriations may from time to time be made by law.

Pocomoke River, Md.

Improving Pocomoke River, Maryland: Continuing improvement, three thousand dollars.

Potomac River, below Washington.
Proviso.
Contracts.

Improving Potomac River at and below the city of Washington, District of Columbia, one hundred thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for the materials and work necessary for the completion of the improvements below the city of Washington, in accordance with the project submitted November sixth, eighteen hundred and ninety-one, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and fifty thousand dollars, exclusive of the amount herein and heretofore appropriated.

Appomattox River, Va.

Improving Appomattox River, Virginia: Continuing improvement, five thousand dollars.

Nansemond River, Va.

Improving Nansemond River, Virginia: Continuing improvement, five thousand dollars.

James River, Va.

Improving James River, Virginia: Continuing improvement, one hundred and fifty thousand dollars.

Nomini Creek, Va.

Improving Nomini Creek, Virginia: Continuing improvement, ten thousand dollars.

Deep Creek, Va.

Improving Deep Creek, Virginia, from the South Branch of the Elizabeth River to the new lock at the Dismal Swamp Canal, Turners Cut Level, Croatan Sound, and Pasquotank River, North Carolina, twenty-five thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the project for the said improvement as submitted by Major Thomas L. Casey, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and thirty-two thousand four hundred and fifty dollars, exclusive of the amount herein appropriated.

Proviso. Contracts.

Rappahannock River, Va.

Improving Rappahannock River, Virginia: Continuing improvement, fifteen thousand dollars.

Urbana Creek, Va.

Improving Urbana Creek, Virginia: Continuing improvement, three thousand dollars.

York River, Va.

Improving York River, Virginia: Continuing improvement, ten thousand dollars.

Occoquan Creek, Va.

Improving Occoquan Creek, Virginia: Continuing improvement, two thousand five hundred dollars.

Lower Machodoc Creek, Va.

Improving Lower Machodoc Creek, Virginia: Continuing improvement, one thousand five hundred dollars.

Nandua Creek, Va.

Improving Nandua Creek, Virginia: Completing improvement in accordance with the project submitted June seventeenth, eighteen hundred and ninety-five, three thousand dollars in addition to the amount heretofore appropriated.

Elk River, W. Va.

Improving Elk River, West Virginia: Continuing improvement, the funds now available for expenditure above Frametown, Braxton County, West Virginia, shall, so far as may be necessary, be spent in removing snags, overhanging timber, bowlders, and other similar obstructions.

Little Kanawha River, W. Va.

Improving Little Kanawha River, West Virginia: For clearing obstructions and maintenance, seven hundred and forty-three dollars.

Guyandotte River, W. Va.

Improving Guyandotte River, West Virginia: For maintenance, one thousand dollars.

North East River, N. C.

Improving North East River, North Carolina: For maintenance, two thousand dollars.

Cape Fear River, N. C.

Improving Cape Fear River, North Carolina, above Wilmington: Continuing improvement and maintenance, five thousand dollars.

Improving Cape Fear River, North Carolina, at and below Wilmington: Continuing improvement, one hundred and fifty thousand dollars.

Contentnia Creek, N. C.

Improving Contentnia Creek, North Carolina: For maintenance, including snagging, two thousand dollars.

Neuse River, N. C.

Improving Neuse River, North Carolina: For maintenance, ten thousand dollars.

Pamlico and Tar rivers, N. C.

Improving Pamlico and Tar rivers, North Carolina: Continuing improvement and for maintenance, fifteen thousand dollars.

Trent River, N. C.

Improving Trent River, North Carolina: For maintenance, two thousand five hundred dollars.

Black River, N. C.

Improving Black River, North Carolina: For maintenance, two thousand dollars.

Water route from Norfolk to Albemarle Sound, N. C.

Improving inland water route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina, through Curri tuck Sound: Continuing improvement, eight thousand dollars.

Fishing Creek, N. C.

Improving Fishing Creek, North Carolina: Completing improvement, seven thousand seven hundred and fifty dollars.

Town Creek, N. C.

Proviso. Draw at Upper Bridge.

Improving Town Creek, Brunswick County, North Carolina: To make a channel forty feet wide at bottom and five feet deep at mean low water from the mouth to Upper Bridge, and to snag and remove obstructions from the creek from the mouth to The Rocks: *Provided*, That no work be done until Upper Bridge is provided with a proper draw, eight thousand five hundred dollars.

Great Pedee River, S. C.

Improving Great Pedee River, South Carolina: Continuing improvement, four thousand dollars.

Santee River, S. C.

Improving Santee River, South Carolina: Continuing improvement, twenty thousand dollars.

Waccamaw River, N. C. and S. C.

Improving Waccamaw River, North Carolina and South Carolina: Continuing improvement, three thousand dollars.

Wateree River, S. C.

Improving Wateree River, South Carolina: For maintenance, two thousand five hundred dollars.

Congaree River, S. C.

Proviso. Contracts.

Improving Congaree River, South Carolina, from Gervais Street Bridge, Columbia, to Granby, in accordance with plan submitted January second, eighteen hundred and ninety-four, fifty thousand dollars: *Provided*, That contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said improvement, to be paid for as appropriations may from time to time be made by law, not exceeding in the aggregate two hundred thousand dollars exclusive of the amount herein appropriated.

Altamaha River, Ga.

Improving Altamaha River, Georgia: Continuing improvement, six thousand dollars.

Chattahoochee River, Ga. and Ala.

Dredge boat for, and Flint, etc., rivers.

Surveys.

Improving Chattahoochee River, Georgia and Alabama: Continuing improvement, fifty thousand dollars, of which fifteen thousand dollars, or as much thereof as may be necessary, may be applied to the building or purchase of a dredge boat to be used on the Chattahoochee, Flint, and Appalachicola rivers; and five thousand dollars, or so much thereof as may be necessary, shall be applied to the survey of that portion of the river between West Point and Franklin, and, in addition, the balance of appropriation heretofore made now on hand shall be available for the purpose of the survey.

Flint River, Ga.

Improving Flint River, Georgia: Continuing improvement, five thousand dollars.

Ocmulgee River, Ga.
Proviso.
Contracts.

Improving Ocmulgee River, Georgia: Continuing improvement, twenty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War to complete the present project of improvement, namely: The project proposed in the report of a preliminary examination and survey of Captain O. M. Carter, printed in House Executive Document Number Two hundred and fifteen, Fifty-first Congress, first session, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and thirty-six thousand dollars, exclusive of amounts herein and heretofore appropriated.

Oconee River, Ga.

Improving Oconee River, Georgia: Continuing improvement, ten thousand dollars.

Savannah River, Ga.
Proviso.
Contracts.

Improving Savannah River between Augusta and Savannah: Continuing improvement, twenty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for the materials and work that may be necessary to complete the existing project of improvement, namely: The project provided by the survey of eighteen hundred and ninety, and published in the Appendix to the Report of the Chief of Engineers, eighteen hundred and ninety, pages thirteen hundred and twenty-eight to thirteen hundred and sixty-three, or the required materials may be purchased and the work done otherwise than by contract, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and fifty thousand dollars, exclusive of the amounts herein and heretofore appropriated.

Savannah River, above Augusta.

Improving Savannah River above Augusta, Georgia: Continuing improvement, one thousand dollars.

Coosa River, Ga. and Ala.

Improving Coosa River between Rome, Georgia, and the East Tennessee, Virginia and Georgia Railroad bridge in Alabama: For maintenance and deepening the channel over the shoals and removing obstructions therefrom, twenty thousand dollars.

Apalachicola River, Fla.

Improving Apalachicola River, Florida, including the cut-off and Lower Chipola River: Continuing improvement, three thousand dollars.

Caloosahatchee River, Fla.

Improving Caloosahatchee River, Florida: For maintenance, two thousand dollars.

Choctawhatchee River, Fla. and Ala.

Improving Choctawhatchee River, Florida and Alabama: Continuing improvement, sixteen thousand dollars; of which amount ten thousand dollars shall be expended for the improvement of the river between Newton and Geneva.

Escambia and Conecuh rivers, Fla.

Improving Escambia and Conecuh rivers, Florida: Continuing improvement, five thousand dollars.

Manatee River, Fla.
Proviso.
Dredging Cut-Off channel.

Improving Manatee River, Florida: Continuing improvement, ten thousand dollars: *Provided*, That eight thousand dollars, or so much thereof as may be necessary, be used in dredging, deepening, and otherwise improving the navigation of the channel known as the Cut-Off, extending from said Manatee River, on the north side thereof, and below the town of Palmetto, in Terraceia Bay.

St. Johns River, Fla.

Improving Saint Johns River, Florida, from Jacksonville to the ocean: Continuing improvement, two hundred thousand dollars.

Suwanee River, Fla.

Improving Suwanee River, Florida: Continuing improvement, five thousand dollars.

Volusia Bar, Fla.

Improving Volusia Bar, Florida: For maintenance, two thousand dollars.

Ocklawaha River, Fla.

Improving Ocklawaha River, Florida: For maintenance, three thousand dollars.

Sarasota Bay, Fla.

Improving Sarasota Bay, Florida: Continuing improvement, five thousand dollars.

Indian River, Fla.

Improving Indian River, Florida: By dredging channel at Negro Cut near Indian River Inlet, five thousand dollars; and the unexpended balance of the amount heretofore appropriated may be expended in the construction of training wall or piling for the protection of the dredged channel.

Upper Chipola River, Fla.

Improving Upper Chipola River, Florida, in accordance with the project submitted, five thousand dollars.

Anclote River, Fla.

Improving Anclote River, Florida, in accordance with the project submitted, five thousand dollars.

Black Water River, Fla.

Improving Black Water River, Florida, from Milton to its mouth, in accordance with the project submitted, five thousand dollars.

Holmes River, Fla.

Improving Holmes River, Florida, from Vernon to its mouth: So much of the unexpended balance as is necessary in the opinion of the Secretary of War is hereby reappropriated for maintenance in accordance with the existing project.

St. Johns River, Fla.

Improving Saint Johns River, Orange Mills Flats, Florida, in accordance with the approved project, forty thousand dollars.

Dredge, etc., Florida improvements.

The sum of thirty-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, to be expended, in the discretion of the Secretary of War, in the purchase or construction of a suitable dredge, with snagging outfit, to be used in connection with the several works of river and harbor improvement on the coast of Florida and the waters tributary thereto.

Boat to remove the water hyacinth.

The sum of twenty-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, to be expended under the direction of the Secretary of War, for the construction of a boat suitable for operating on the navigable streams of the State of Florida, in removing therefrom the aquatic plant known as the water hyacinth, so far as it is an obstruction and hindrance to interstate or foreign commerce; also, one thousand dollars for log booms to be used as adjuncts to such steamer, and ten thousand dollars for conducting the necessary operations, making thirty-six thousand dollars in all, according to the estimate and recommendation of the War Department as found in House Document Number Ninety-one, Fifty-fifth Congress, third session.

—expenses, etc.

Alabama River, Ala.

Improving Alabama River, Alabama: Continuing improvement, fifty thousand dollars.

Black Warrior River, Ala.

Proviso. Contracts.

Improving Black Warrior River, Alabama, from Tuscaloosa to Daniels Creek: Continuing improvement, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to construct Lock and Dam Numbered Four, above Tuscaloosa, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and forty thousand five hundred dollars, exclusive of the amount herein and heretofore appropriated.

Warrior and Tombigbee rivers, Ala.

Proviso. Contracts.

Improving Warrior and Tombigbee rivers, Alabama: Continuing improvement of Warrior River, two hundred and twenty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to construct three locks and dams next below Tuscaloosa, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate four hundred and forty thousand dollars, exclusive of the amount herein and heretofore appropriated.

Tombigbee River.

Improving Tombigbee River from Fulton to Columbus: Continuing improvement and for maintenance, five thousand dollars.

Improving Tombigbee River from Demopolis, Alabama, to Columbus, Mississippi: Continuing improvement, ten thousand dollars.

Improving Tombigbee River from Walkers Bridge to Fulton: Continuing improvement and for maintenance, one thousand dollars.

Proviso. Lock at McGrews Shoals.

Improving Tombigbee River, Alabama, from mouth to Demopolis: Continuing improvement, fifty thousand dollars: *Provided*, That the same or so much thereof as may be necessary shall be used to complete the lock at McGrews Shoals.

Big Sunflower River, Miss.

Improving Big Sunflower River, Mississippi: Continuing improvement, five thousand dollars.

Pascagoula River, Miss., and Horn Island Harbor.

Proviso. Contracts.

Pascagoula River, Mississippi, and Horn Island Harbor: Improving the same as recommended by the reports dated December twenty-eighth, eighteen hundred and ninety-six, and August twenty-ninth, eighteen hundred and ninety-eight, respectively, fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the plan of improvement so recommended, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and sixty-seven thousand six hundred dollars, exclusive of the amount herein and heretofore appropriated.

Pearl River, Miss.

Improving Pearl River, between Edinburg and Carthage, Mississippi: For maintenance, one thousand dollars.

Improving Pearl River, between Carthage and Jackson, Mississippi: For maintenance, two thousand five hundred dollars.

Improving Pearl River, below Jackson, Mississippi: Continuing improvement, seven thousand dollars, which shall be expended in work on the river, beginning at the head of Holmes Bayou and continuing up the river to Monticello.

Tallahatchee River, Miss.

Improving Tallahatchee River, Mississippi: Continuing improvement, five thousand dollars.

Yazoo River, Miss.

Improving Yazoo River, Mississippi: Continuing improvement, twenty thousand dollars, of which so much as may be necessary may, in the discretion of the Secretary of War, be expended in removing the bar at Yazoo City.

Chickasahay River, Miss.

Improving Chickasahay River, Mississippi: For maintenance, two thousand five hundred dollars.

Leaf River, Miss.

Improving Leaf River, Mississippi: For maintenance, two thousand five hundred dollars.

Homochitto River, Miss.

Improving Homochitto River, Mississippi: Completing improvement, in accordance with the approved project, sixteen thousand dollars.

Pearl River, Miss., mouth.

Mouth of Pearl River, Mississippi: Completing improvement in accordance with the project dated December twenty-third, eighteen hundred and ninety-six, eighteen thousand one hundred and ninety-nine dollars and eighty cents.

Amite River. Bayou Manchac, La.

Improving Amite River and Bayou Manchac, Louisiana: For maintenance, two thousand five hundred dollars.

Boeuf River, La.

Improving Boeuf River, Louisiana: Continuing improvement, six thousand dollars.

Bayou Bartholomew, La. and Ark.

Improving Bayou Bartholomew, Louisiana and Arkansas: For maintenance, five thousand dollars.

Tensas River and Bayou Maçon, La. and Ark.

Improving Tensas River and Bayou Maçon, Louisiana and Arkansas: Completing improvement, four thousand dollars.

Red River, La., Ark., and Ind. T.

Alexandria, La.

Improving Red River, Louisiana, Arkansas, and Indian Territory: Continuing improvement, one hundred and fifty thousand dollars. And an examination shall be made of the harbor of Alexandria, and a report as to what improvement, if any, should be made thereof, together with an estimate of the cost thereof.

Tickfaw River, La.

Improving Tickfaw River, Louisiana: For maintenance, one thousand dollars.

Bayou Lafourche, La.

Improving Bayou Lafourche, Louisiana: For maintenance, seven thousand five hundred dollars.

Chefuncte River and Bogue Falia, La.

Improving Chefuncte River and Bogue Falia, Louisana: For maintenance, one thousand dollars.

Bogue Chitto, La.

Improving Bogue Chitto, Louisiana: Continuing improvement, five thousand dollars.

Bayou Vermilion, La.

Improving channel, bay, and passes of Bayou Vermilion, Louisiana: Continuing improvement, two thousand five hundred dollars.

Boat for waters of Louisiana to remove the water hyacinth.

—expenses, etc.

The sum of twenty-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, to be expended under the direction of the Secretary of War, for the construction of a boat suitable for operating on the navigable streams of the State of Louisiana in removing therefrom the aquatic plant known as the water hyacinth, so far as it is an obstruction and hindrance to interstate or foreign commerce; also, one thousand dollars for log booms to be used as adjuncts to such steamer, and ten thousand dollars for conducting the necessary operations, making thirty-six thousand dollars in all, according to the estimate and recommendation of the War Department as found in

House Document Number Ninety-one, Fifty-fifth Congress, third session.

Bayou Teche, La.

Improving Bayou Teche, Louisiana: Continuing improvement, ten thousand dollars.

Mermentau River, La.

Improving Mermentau River and tributaries, Louisiana: Completing improvement, six thousand one hundred and fifteen dollars and twenty-five cents.

Johnson's Bayou, La.

Improving Johnson's Bayou, Louisiana: Completing improvement in accordance with the approved project, two thousand five hundred dollars.

Bayou Courtableau, La.

Improving Bayou Courtableau, Louisiana: Continuing improvement, by removal of the raft at its mouth and preventing re-formation thereof, twenty thousand dollars.

Trinity River, Tex.

Proviso.

Preliminary survey of, etc.

Improving Trinity River, Texas: Continuing improvement, seven thousand dollars: *Provided*, That out of said sum the Secretary of War is hereby directed to cause a preliminary survey of said Trinity River to be made from its mouth to the city of Dallas, with separate estimates of the cost of procuring a navigable depth at low water of four feet, five feet, and six feet, respectively, in said river, by locks and dams or otherwise; said report to include the best method for improving the river, and such report may be made so as to divide said river into separate sections, with a statement of the advisability of such improvement.

Sabine River, Tex.

Improving Sabine River, Texas: For maintenance, two thousand dollars.

Brazos River.

West Galveston Bay Channel, Double Bayou, etc.

For the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay Channel, Double Bayou, and the mouths of adjacent streams, sixty-five thousand dollars, out of which said sum a suitable dredge and snagging outfit may be provided to carry on said work and to be used on other approved projects on the Texas coast, including streams emptying into the Gulf of Mexico and bays connected therewith.

Sabine and Neches rivers.

Proviso.

Board to reexamine channel through Sabine Lake.

Improving the mouths of the Sabine and Neches rivers, ten thousand dollars: *Provided*, That from said amount there shall be paid the expenses of making a survey by a board of engineers to be designated by the Secretary of War, and said board shall make a reexamination of the proposed channel through Sabine Lake and make a report thereon.

Arkansas River, Ark. and Ind. T.

Provisos.

Distribution.

Removing snags, etc.

Improving Arkansas River, Arkansas and Indian Territory: Continuing improvement, one hundred thousand dollars: *Provided*, That the Secretary of War may, in his discretion, use so much of said sum as may be necessary to repair and protect existing dikes, and to remedy and guard against any injury to the harbors or river banks in their vicinity that may have been injured or endangered by reason of changes in the channel or encroachments of the river at or near Pine Bluff, Little Rock, Dardanelle, Van Buren, and Fort Smith, for the purpose of confining the river to the adopted channel, so as to give ease and safety to navigation: *Provided further*, That in the discretion of the Secretary of War the sum of fifty thousand dollars of said amount hereby appropriated may be used in removing snags, sand bars, and other obstructions to navigation in

Board to examine river.

Report on improvements.

said river, and in repairing and operating snag boats. The President is authorized to appoint a board of three from the Corps of Engineers, whose duty it shall be to thoroughly examine the Arkansas River and report as soon as practicable to the Secretary of War such plan for the permanent improvement of said river as in their opinion is most feasible and best adapted to the necessities of commerce, together with a statement as to the usefulness of such improvement to navigation and its relation and value to commerce. They shall also report the details of such plan, with estimates of the cost thereof. The cost of such examination and survey and the expenses of said board shall be paid out of the sum above appropriated.

St. Francis River, Ark.
L'Anguille River.

Improvement of Saint Francis River, Arkansas: Continuing improvement, eight thousand dollars; of which sum one thousand dollars may, in the discretion of the Secretary of War, be expended in removing obstructions in the L'Anguille River, its tributary, from its mouth to the town of Marianna.

Arkansas River.

Improving Arkansas River: Removing obstructions and operating snag boats, twenty thousand dollars.

Black River, Ark. and Mo.

Improving Black River, in Arkansas and Missouri: Continuing improvement, eight thousand dollars.

White River, Ark.

Improving White River, Arkansas: For completion, fourteen thousand eight hundred and fifteen dollars.

Cache River, Ark.

Improving Cache River, Arkansas: To be expended in removing obstructions, one thousand dollars.

Upper White River, Ark.

Contracts.

Improving Upper White River, Arkansas: For the construction of Lock and Dam Number One, on Upper White River, at or near Batesville, according to the project, plans, and specifications submitted in report printed in House Document Number Seventy-eight, Fifty-fourth Congress, second session, to complete said lock and dam, one hundred and sixty thousand dollars, and the Secretary of War may also enter into contract or contracts for the completion of Lock and Dam Number Two, according to same plan, at a cost not to exceed one hundred and fifty thousand dollars, to be paid for as appropriations may from time to time be made by law.

Current River, Ark. and Mo.

Improving Current River, in Arkansas and Missouri: Continuing improvement, and for maintenance, five thousand dollars.

Buffalo Fork of White River, Ark.

Improving Buffalo Fork of White River, Arkansas: For completion of improvement, according to project, plans, and specifications printed in the Annual Report of the Chief of Engineers for eighteen hundred and ninety-seven, pages nineteen hundred and ninety-four et sequentes, three thousand five hundred dollars.

Ouachita and Black rivers, Ark. and La.

Improving Ouachita and Black rivers, Arkansas and Louisiana: Continuing improvement, one hundred and ten thousand dollars, of which sum so much as may be necessary shall be used by the Secretary of War in his discretion for the completion of the survey of said Ouachita River, heretofore authorized, for the purpose of obtaining a plan of construction and estimates of the cost of the locks and dams necessary to give slack-water navigation.

Clinch River, Tenn.

Improving Clinch River, Tennessee: Completing improvement, eight thousand five hundred dollars.

Cumberland River, Tenn.

Improving Cumberland River above Nashville, Tennessee, one hundred thousand dollars, of which amount so much as may be available, besides the amount required for essential maintenance, may be applied toward the completion of unfinished locks and dams one, five, six, and seven, or either of them.

Harpeth Shoals.

Improving Cumberland River below Nashville, Tennessee, one hundred thousand dollars, of which amount so much as may be available, besides the amount required for essential maintenance, shall be applied in the construction of the lock and dam and other projected improvements at Harpeth Shoals.

French Broad and Little Pigeon rivers, Tenn.

Improving French Broad and Little Pigeon rivers, Tennessee: Continuing improvement, five thousand dollars.

Tennessee River.

Improving Tennessee River below Riverton, Alabama, one hundred thousand dollars; and so much thereof as may be necessary may be used for the construction and equipment of a dredge boat.

Improving Tennessee River between Chattanooga and Riverton, thirty-five thousand dollars, of which amount so much as may be necessary shall be applied in the survey of that portion between Bridgeport and Decatur and a resurvey of the remaining portions of said river between the points named, and in making the survey between Chattanooga and Shellmounds through that portion of the river commonly called the "Suck," an examination shall be made with a view to the construction of locks and dams suitable for convenient and safe navigation, also if on examination it shall be thought desirable, an estimate shall be made of the cost of constructing a canal across Moccasin Bend below Chattanooga: *Provided*, That so much as may be necessary may be used for a survey of the Clinch and French Broad rivers.

Proviso.
Survey Clinch, etc., rivers.

Improving Tennessee River at Colbert Shoals and Bee Tree Shoals: Continuing improvement, one hundred thousand dollars.

Improving Tennessee River above Chattanooga: Continuing improvement, thirty thousand dollars.

Obion River, Tenn.

Improving Obion River, Tennessee: For maintenance, two thousand five hundred dollars.

Forked Deer River, Tenn.

Improving Forked Deer River, Tennessee: For maintenance, two thousand dollars.

Elk River, Tenn.

Improving Elk River, Tennessee: Continuing improvement, four thousand dollars.

Big Sandy River, Ky. and W. Va.

Provisos.
Contracts.

Improving Big Sandy River, Kentucky and West Virginia: Continuing improvement, fifty-two thousand five hundred dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete two locks and dams in the Big Sandy River between Louisa and the mouth of the Big Sandy River, in accordance with the report of April twenty-seventh, eighteen hundred and ninety-eight, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate four hundred and twenty thousand dollars, exclusive of the amount herein and heretofore appropriated: *Provided further*, That of the amount authorized to be expended, one thousand dollars may be expended for maintenance on Leviza Fork, and one thousand five hundred dollars on Tug Fork, and twenty thousand dollars, or so much thereof as may be necessary, for a detailed survey of the Big Sandy River and Leviza and Tug forks of the same in Kentucky and West Virginia: *Provided*, That the rest of the amount may be used for the local survey, acquisition of sites, and commencement of construction of the above-named locks and dams.

Distribution.

—sites, etc.

Green River, Ky.

Improving Green River, Kentucky, above the mouth of Big Barren River: Completing improvement, eighty-five thousand six hundred and seventy-three dollars and twenty cents.

Licking River, Ky.

For survey of Licking River, Kentucky, from its mouth, opposite Cincinnati, Ohio, to Falmouth, Pendleton County, Kentucky, and for estimate of the cost of a lock and dam at or near Three Mile Riffle, about three miles from its mouth, ten thousand dollars.

Ohio River, from head to mouth.

Improving Ohio River from its head to its mouth: Continuing improvement, three hundred and seventy-five thousand dollars, of which amount the Secretary of War is hereby authorized to expend thirty-five thousand dollars, or so much thereof as may be necessary, upon a survey of said Ohio River from Marietta, Ohio, to the mouth of the Big Miami River, with a view to the improvement of said river between said points by movable dams and otherwise, so as to provide six feet of water in said river at low water, this survey to include a report upon the location of the necessary dams and the probable cost thereof: *Provided further*, That out of the three hundred and seventy-five thousand dollars herein appropriated there shall be expended the following sums, or so much thereof as may be necessary, to wit: Thirty-five thousand dollars for general snagging purposes; twenty thousand dollars for dredging the harbor at Madison, Indiana, to six feet depth at low water, of which so much as may be necessary may be spent upon a special survey to determine the total cost of extending such harbor up to the present low-water front of said city; ten thousand dollars for dredging the harbor at Golconda, Illinois; ten thousand dollars for dredging the harbor at Brooklyn, Illinois; twenty-five thousand dollars for dredging and dikes to deepen the river channel at Mound City, Illinois; fifteen thousand dollars upon the continuation of the repair of the embankment at Lawrenceburg, Indiana; twenty-five thousand dollars upon the continuation of the embankment at Shawneetown, Illinois; one thousand dollars for a survey of the river bank and adjoining ground at or near New Liberty, Illinois, so far as necessary to determine the cost of work necessary to prevent the Ohio River from cutting through its banks at this locality, the survey to include a report upon the same; one thousand dollars for a survey of the river bank at or near Paducah, Kentucky, so far as necessary to determine the cost of properly protecting the city front against injury by high water, the survey to include a

Distribution.

Evansville, Ind., dredging. Vol. 29, p. 225.

report upon the same: *Provided further*, That out of the unexpended balance of the funds already appropriated by the river and harbor Act of eighteen hundred and ninety-six, for the harbor at Evansville, Indiana, the sum of twenty thousand dollars shall be spent for dredging along the city front of said city.

Ohio River. Dam No. 13.

Improving Ohio River: Continuing improvement at Dam Numbered Thirteen, fifty thousand dollars, to be used for the local survey, acquisition of site, and commencement of construction of said dam in accordance with the report of December twenty-eighth, eighteen hundred and ninety-eight: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said improvement, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate eight hundred thousand dollars, exclusive of the amount herein appropriated.

Proviso. Contracts.

Dam No. 18.

Improving Ohio River: Continuing improvement at Dam Numbered Eighteen, fifty thousand dollars, to be used for the local survey, acquisition of site, and commencement of construction of said dam in accordance with the report of December twenty-eighth, eighteen hundred and ninety-eight: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said improvement, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate eight hundred thousand dollars, exclusive of the amount herein appropriated.

Proviso. Contracts.

Belle River, Mich.

Improving Belle River, Michigan: Completing improvement, ten thousand dollars.

Hay Lake Channel, St. Marys River.

Improving Hay Lake Channel, Saint Marys River: Continuing improvement, one hundred thousand dollars: *Provided*, That for the purpose of more rapidly prosecuting the project of improvement as heretofore adopted and entered upon, in addition to expending the balance on hand, a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary for such purpose, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three hundred and ninety-four thousand one hundred and fifteen dollars, exclusive of the amount herein and heretofore appropriated: *Provided further*, That the Secretary of War shall cause to be made and reported as early as practicable, a survey of the connecting waters between Lakes Superior and Huron, including Hay Lake Channel, with a plan and estimate of the cost of such improvement as will secure a safe and convenient channel twenty-one feet deep between said lakes, the expense of which shall be paid from the said appropriation for improving Hay Lake Channel.

Provisos. Contracts.

Survey between Lakes Huron and Superior.

Saginaw River, Mich.

Improving Saginaw River, Michigan: Continuing improvement, forty thousand dollars.

Pine River, Mich.

Improving Pine River, Michigan: Completing improvement, five thousand five hundred and sixty dollars.

Black River, Mich.

Improving Black River, Michigan, at the mouth: Continuing improvement, four thousand dollars.

Detroit River, Mich.

Provisos.
Contracts.

Survey from Detroit to Lake Erie.

Improving Detroit River, Michigan, removing shoals from Detroit to Lake Erie: Continuing improvement, one hundred thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the same in accordance with the present project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate six hundred and sixty-one thousand five hundred dollars, exclusive of the amount herein and heretofore appropriated: *Provided further*, That the Secretary of War shall cause to be made and reported as early as practicable a survey of the Detroit River from Detroit to Lake Erie, with a plan and estimate of the cost of such improvement as will secure a safe and convenient channel twenty-one feet deep between said points, the expense of which shall be paid from the said appropriation for improving Detroit River.

Black River, Mich.

Improving Black River at Port Huron, Michigan: Continuing improvement, four thousand dollars.

Kalamazoo River, Mich.

Improving Kalamazoo River, Michigan: Continuing improvement, ten thousand dollars.

Grand River, Mich.

Improving Grand River, Michigan: Continuing improvement, seventy-five thousand dollars.

Sebewaing River, Mich.

Improving Sebewaing River, Michigan: Completing improvement, thirty-two thousand dollars.

Rouge River, Mich.

Improving Rouge River, Michigan: Any amount heretofore appropriated for the construction of a turning basin at Rouge River, Michigan, which is now unexpended, or so much thereof as may be necessary, shall, in the discretion of the Secretary of War, be made available for improving the channel of said river.

Chippewa River, Wis.

Improving Chippewa River, Wisconsin, including yellow banks: Continuing improvement, ten thousand dollars.

Fox River, Wis.
Distribution.

Improving Fox River, Wisconsin: Continuing improvement, twenty-seven thousand five hundred dollars, of which amount the sum of three thousand dollars, or so much thereof as may be necessary, shall be used to remove bars and snags from and to otherwise improve Wolf River below Shawano, Wisconsin; and two thousand dollars of said sum, or so much thereof as may be necessary, shall be used in the protection of and in further improving the harbor of refuge established and partially constructed on the east shore of Lake Winnebago, Wisconsin, under the provisions of the river and harbor Act, eighteen hundred and ninety-six, and two thousand five hundred dollars of said sum, or so much thereof as may be necessary, shall be used in the construction of a retaining wall on the north side of the canal, at the city of Kaukauna, for the protection of said canal.

St. Croix River, Wis. and Minn.

Improving Saint Croix River, Wisconsin and Minnesota: Continuing improvement, nine thousand dollars.

Menominee River, Mich. and Wis.

Improving Menominee River, Michigan and Wisconsin: According to the second, or dredging, plan, reported November thirtieth, eighteen hundred and ninety-six, eighteen thousand nine hundred and twenty dollars.

Red River of the North, Minn.

Red Lake River.

Improving Red River of the North, Minnesota, and its tributaries: Continuing improvement, twenty-five thousand dollars, of which sum ten thousand dollars, or so much thereof as may be necessary, shall be used in improving the navigation of the Red Lake River.

Minnesota River, Minn.

Improving Minnesota River, Minnesota: Continuing improvement, one thousand dollars; said sum, or so much thereof as may be necessary, to be used in removing the bar at or near the mouth of said river.

For removing a sand bar at the mouth of Warroad River, Minnesota, three thousand dollars, or so much thereof as may be necessary.

Red Lake and Red Lake River, Minn.

For making a survey of Red Lake and Red Lake River, Minnesota, with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and said Red Lake River, Minnesota, and estimating the cost of said improvement, five thousand dollars.

Otter Tail Lake and River, Minn.

For making a survey of Otter Tail Lake and Otter Tail River, Minnesota, with a view to the construction of a dam at the outlet of said lake, for the purpose of improving the navigation on the Red River of the North, Minnesota, and estimating the cost of said improvement, three thousand dollars.

Big Stone Lake and Lake Traverse, Minn. and S. Dak.

For making a further survey of Big Stone Lake and Lake Traverse, Minnesota and South Dakota, with a view to construct reservoirs therein for the improvement of the navigation of the Minnesota River, and an estimate of the cost of such improvements, five thousand dollars.

Wabash River, Ind. and Ill.

Improving Wabash River, Indiana and Illinois, above Vincennes: Completing improvement, four thousand dollars.

Improving Wabash River, Indiana and Illinois, below Vincennes: Continuing improvement, fifteen thousand dollars.

Calumet River, Ill.

Proviso.

Location of improvement.

Improving Calumet River, Illinois: Continuing improvement, sixty thousand dollars: *Provided*, That the expenditure of said money shall be made upon said river from the mouth thereof to the forks in said river.

Illinois River, Ill.

Improving Illinois River, Illinois: Continuing improvement, one hundred thousand dollars.

Illinois and Des Plaines Rivers, Ill.

Board to survey, etc.

Illinois River and Des Plaines River, Illinois: The Secretary of War is directed to appoint a board of three engineers, which board shall make a survey and estimates of cost for the improvement of the Upper Illinois River and Lower Des Plaines River, in Illinois, with a view to the extension of navigation from the Illinois River to Lake Michigan at or near Chicago; said board of engineers shall report the estimates of cost for a channel seven feet deep, and also for a channel eight feet deep, throughout said proposed route; said survey and estimates of cost shall be made in pursuance of and according to the recommendations in report of January twenty-seventh, eighteen hundred and ninety-seven, and there is hereby appropriated for the expenses of said board and such survey the sum of thirty thousand dollars, or so much thereof as may be necessary.

Mississippi River.
Reservoirs at headwaters.
Renewal and repair, etc.
Provisos.
Surveys of flowage lines directed. Winnibigoshish, etc., reservoirs, etc.
Floods, Sandy Lake, etc.
Failure of embankment, Pine River reservoir.

Reservoirs at the headwaters of the Mississippi River: Continuing improvement, two hundred and ten thousand dollars. The funds herein appropriated, and the unexpended balance of former appropriations for this work, shall be expended for the necessary renewal and repair of the reservoirs that have already been completed, and for the purchase of the lands, or easements therein, which are necessarily subject to overflow by reason of the legitimate operation of the said completed reservoirs: *Provided*, That so much of said funds as may be required may, in the discretion of the Secretary of War, be expended in making full and accurate surveys of the flowage lines of Winnibigoshish, Leech Lake, Pokegama Falls, and Pine River reservoirs, and in permanently marking such lines on the ground; also in making a survey and investigation to determine the causes of, and the means of preventing, the excessive floods on the river between the Government dam at Sandy Lake and Brainerd, Minnesota, and the effect thereof on the interests of navigation: *Provided further*, That of said funds a sum of not exceeding two thousand five hundred dollars may be used, and is hereby made available, for the payment of damages, if any, to lands and tenements caused by the failure of the natural embankment of the Pine River reservoir on June seventeenth, eighteen hundred and ninety-six.

Work under Mississippi River Commission.

For work in accordance with the plans and specifications of the Mississippi River Commission:

New Orleans, La.

At the harbor of New Orleans, Louisiana: Continuing improvement, one hundred and ten thousand dollars.

Natchez and Vidalia, Miss. and La.

At the harbor of Natchez and Vidalia, Mississippi and Louisiana, fifty thousand dollars.

Memphis, Tenn.

At the harbor of Memphis, Tennessee: The Mississippi River Commission is directed to examine the harbor at Memphis, Tennessee, and report what improvement, if any, should be made to remove the bar in front of the city of Memphis, together with the cost thereof.

Red and Atchafalaya rivers, La.

For rectification of Red and Atchafalaya rivers, Louisiana: Continuing improvement, twenty-five thousand dollars.

Improvement between St. Paul and Minneapolis, etc.
Proviso.
Contracts.

Improving the Mississippi River, between the Chicago, Saint Paul, Minneapolis and Omaha Railroad Bridge at Saint Paul, and the Washington Avenue Bridge at Minneapolis: Continuing improvement, one hundred and fifty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete said improvement, or said material may be purchased and the work done otherwise than by contract, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate eight hundred and fifteen thousand five hundred and seventy-nine dollars and thirty-three cents, exclusive of the amount herein and heretofore appropriated.

Missouri River Commission.

For improving the Missouri River from its mouth to Sioux City, Iowa, according to plans and specifications of the Missouri River Commission, one hundred thousand dollars: *Provided*, That of this amount the following sums, or so much thereof as may be necessary, in the discretion of the Secretary of War, shall be expended for continuing improvements at the following places, namely: For work at the mouth of Kaw River, in Missouri, five thousand dollars; for work on the right bank above the mouth of Little Blue River, in Missouri, five thousand dollars; for work above Glasgow, Missouri, ten thousand dollars; for work near Huntsdale, Missouri, ten thousand dollars; for local works above Kansas City, Missouri, not yet completed, twenty thousand dollars; for repairs on works and contingencies, fifteen thousand dollars: *Provided, also*, That of the said amount of one hundred thousand dollars the sum of thirty-five thousand may be expended in operating snag-boats on the Missouri River between Sioux City and its mouth, in removing snags, wrecks, and other obstructions.

Provisos. Distribution.

Snag-boats, etc.

Judith, Mont.

To repair the south bank of the Missouri River at the town of Judith, Montana, five thousand dollars.

Fort Benton, Mont.

To repair the levee at the town of Fort Benton, Montana, and confine the river within its present limits, five thousand dollars.

Gasconade River, Mo.

Improving Gasconade River, Missouri: Continuing improvement, fifteen thousand dollars.

Osage River Mo.

Improving Osage River, Missouri, by the construction of a lock and dam in accordance with the plan and estimate submitted by the Missouri River Commission in their report of July twelfth, eighteen hundred and ninety-eight, and printed in Volume Six of the Report of the Chief of Engineers for the year eighteen hundred and ninety-eight, twenty-five thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such work and materials as may be necessary for the completion of such lock and dam, or the materials may be purchased and the work done otherwise than by contract, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate one hundred and forty-six thousand dollars, exclusive of the amount herein and heretofore appropriated.

Proviso. Contracts.

Improving Missouri River above Sioux City, Iowa.

Improving Missouri River: For the removal of obstructions in the Missouri River above Sioux City, Iowa, fifty thousand dollars.

Improving Missouri River: Continuing improvement, above Sioux City, to and including Bismark, one hundred and seventy thousand dollars, to be expended in the discretion of the Secretary of War.

For the improvement of the Missouri River on the Nebraska side opposite Sioux City, Iowa, and from the lower limits thereof to a point opposite Elkpoint in South Dakota, the sum of twenty-five thousand dollars, to be expended under the direction of the Secretary of War.

Sacramento River, Cal.

Improving Sacramento River, California, from the city of Sacramento to the mouth: Continuing improvement, thirty thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such ma-

Proviso. Contracts.

terials and work as may be necessary to carry out the revised project printed in House Document Number One hundred and eighty-six, Fifty-fifth Congress, second session, and House Document Number Forty-eight, Fifty-fifth Congress, third session, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate the sum of two hundred and fifty thousand dollars, exclusive of amount herein and heretofore appropriated. The Secretary of War is hereby authorized to accept from the State of California the use of any dredger, or appliances owned or controlled by said State, conformably to any offer thereof by the said State; and the Secretary of War is hereby authorized to use any such dredger or appliances in any river or harbor improvement that may be prosecuted therein by the United States, either on the part of the United States alone or conjointly with said State: *Provided*, That nothing shall be paid to the State of California for the use of said dredger, and that nothing herein contained shall create any liability against the United States.

Acceptance from California of dredger authorized.

Proviso.
No payment.

Restraining of mining débris, California.
Laws, 2d sess. 55th Cong., p. 631.
Agreement that contractor shall look solely to State for half expenses to apply to future provisions.

That the provisions of an Act of Congress, entitled "An Act making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-nine, and for other purposes," approved July first, eighteen hundred and ninety eight, authorizing the Secretary of War, in expending certain specified appropriations in the preparation for and construction of certain works for the restraining or impounding of mining débris in the State of California, to enter into a contract or contracts wherein the contractor or contractors shall look solely to that State for one-half of such expense, and that the United States shall in no wise be liable for said one-half, are hereby extended to any appropriations, when made, that may hereafter be made for said purposes.

Work done by hired labor where available funds sufficient, etc

That the Secretary of War, in carrying out the provisions of any Act of Congress providing for the restraining or impounding of mining débris in California, may, in his discretion, when in his judgment the aggregate of appropriations already made by said State and Congress and available therefor are sufficient to complete the same, undertake the works necessary thereto by hired labor and by purchase of supplies and materials therefor, and may accept payments on account thereof as the work progresses under and according to the provisions of the acts of the legislature of said State for such purposes.

San Joaquin River, Cal.

Improving San Joaquin River, California: Continuing improvement, twenty thousand dollars, to be expended in dredging, making cut-offs, or otherwise improving said river, and Stockton and Mormon Channels to the heads of navigation.

Petaluma Creek, Cal.

Improving Petaluma Creek, California: Continuing improvement, four thousand dollars.

Upper Columbia and Snake rivers, Oreg. and Wash.

Improving Upper Columbia and Snake rivers, Oregon and Washington: Continuing improvement, seven thousand five hundred dollars.

Coos River, Oreg.

Improvement of Coos River, Oregon: Completing improvement, three thousand dollars.

Columbia River, Oreg., canal at Cascades.

Canal at Cascades, Columbia River, Oregon: Continuing improvement, seventy-five thousand dollars.

Long Tom River, Oreg.

Laws, 1st sess. 55th Cong., p. 47.

Transfer of appropriation for Willamette River, above Portland.

Improving Long Tom River, Oregon: The sum of three thousand dollars, or so much thereof as may be necessary to be expended in the discretion of the Secretary of War, is hereby transferred from the balance remaining to the credit of the appropriation made June fourth, eighteen hundred and ninety-seven, Sundry Civil Act, for the improvement of the Willamette River above Portland.

Lower Willamette River, Oreg., Columbia River, Oreg. and Wash.

Improving Lower Willamette River in front of and below Portland, Oregon, and Columbia River below the Willamette River in Oregon and Washington: Continuing improvement, one hundred and fifty thousand dollars.

Coquille River, Oreg.

Improving Coquille River, below Coquille City, Oregon: Continuing improvement, forty thousand dollars.

Clatskanie River, Oreg.

Improving Clatskanie River, Oregon: To complete improvement recommended in report printed in House Document Number Two hundred and eighteen, Fifty-fifth Congress, second session, thirteen thousand dollars.

Columbia River.

For gauging waters of the Columbia River, measuring tidal and river volumes, one thousand dollars.

Upper Coquille River, Oreg.

Improving Upper Coquille River, between Coquille City and Myrtle Point, Oregon: Continuing improvement, nine thousand dollars.

Columbia River below Tongue Point.

Improving Columbia River below Tongue Point by way of the South Channel in front of Astoria, Oregon, in accordance with project submitted in the Annual Report of the Chief of Engineers for eighteen hundred and ninety-five: Completing improvement, seventy-one thousand dollars.

Clearwater River, Idaho.

For improving Clearwater River, Idaho: Completing improvement, ten thousand dollars.

Cowlitz River, Wash.

Improving Cowlitz River, Washington: Continuing improvement, three thousand dollars.

Lewis River, Wash.

For the improvement of the Lewis River, Washington, from its mouth to Lacenter, according to the plan submitted by the Chief of Engineers in his annual report for the year eighteen hundred and ninety-seven, ten thousand dollars.

Puget Sound, Wash.

Improving Puget Sound and its tributary waters, Washington: Continuing improvement in accordance with approved projects, twenty thousand dollars.

Chehalis River, Wash.

Improving Chehalis River, Washington: For snagging, three thousand dollars.

Pend Oreille River, Wash.

For the improvement of the Pend Oreille River, Washington, from Albany Falls to the town of Metalline, Washington, in accordance with approved plans, ten thousand dollars.

Swinomish Slough, Wash.

Improving Swinomish Slough, Washington: Continuing improvement, twenty thousand dollars.

Willapa River, etc., Wash.

Proviso.

Channel through North River jam.

Improving Willapa River and Harbor, Washington: Continuing improvement in accordance with approved project, five thousand dollars: *Provided*, That in the discretion of the Secretary of War so much of this amount as may be necessary shall be expended for more thoroughly clearing a channel through the North River jam.

Okanagon River, Wash.

Improving Okanagon River, Washington: Continuing improvement in accordance with project printed in the Annual Report of the Chief of Engineers for eighteen hundred and ninety-eight, fifteen thousand dollars.

Depth of water in tidal waters defined.

The depth of water in tidal waters, whenever referred to in this Act, shall be understood to mean the depth at mean low water unless otherwise expressed.

Appropriations available for repairs as well as improvement.

Appropriations made for the respective works herein named, or so much thereof as may be necessary, may, in the discretion of the Secretary of War, be used for the repair and restoration of said works whenever from any cause they have become seriously impaired, as well as for the further improvement of said works.

Preliminary examinations, surveys, etc.

SEC. 2. For preliminary examinations, surveys (except where otherwise herein especially provided for), contingencies, expenses connected with inspection of bridges, the service of notice required in such cases, the examination of bridge sites and reports thereon, and for incidental repairs for which there is no special appropriation for rivers and harbors, two hundred thousand dollars: *Provided*, That no preliminary examinations, survey, project, or estimate for new works other than those designated in this or some prior Act or resolution shall be made: *And provided further*, That after the regular or formal report on any examination, survey, project, or work under way or proposed is submitted, no supplemental or additional report or estimate for the same fiscal year shall be made unless ordered by a concurrent resolution of Congress. The Government shall not be deemed to have entered upon any project for the improvement of any waterway or harbor mentioned in this Act until funds for the commencement of the proposed work shall have been actually appropriated by law.

Provisos.
Restricted to designated works.

Reports, etc.

Isthmus of Panama.
Investigation of, for construction of canal.

SEC. 3. That the President of the United States of America be and he is hereby authorized and empowered to make full and complete investigation of the Isthmus of Panama with a view to the construction of a canal by the United States across the same to connect the Atlantic and Pacific oceans; That the President is authorized to make investigation of any and all practicable routes for a canal across said Isthmus of Panama, and particularly to investigate the two routes known respectively as the Nicaraguan route and the Panama route, with a view to determining the most practicable and feasible route for such canal together with the proximate and probable cost of constructing a canal at each of two or more of said routes: And the President is further authorized to investigate and ascertain what rights, privileges and franchises if any may be held and owned by any corporations, associations or individuals, and what work, if any, has been done by such corporations, associations or individuals in the construction of a canal at either or any of said routes, and particularly at the so-called Nicaraguan and Panama routes respectively; and likewise to ascertain the cost of purchasing all of the rights, privileges and franchises held and owned by any such corporations, associations and individ-

Nicaraguan and Panama routes.

Existing franchises.

—cost of purchasing.

uals in any and all of such routes, particularly the said Nicaraguan route and the said Panama route; and likewise to ascertain the probable or proximate cost of constructing a suitable harbor at each of the termini of said canal, with the probable annual cost of maintenance of said harbors respectively. And generally the President is authorized to make such full and complete investigation as to determine the most feasible and practicable route across said Isthmus for a canal, together with the cost of constructing the same and placing the same under the control, management and ownership of the United States.

Cost of harbors at termini.

SEC. 4. To enable the President to make the investigations and ascertainments herein provided for, he is hereby authorized to employ in said service any of the engineers of the United States army at his discretion, and, likewise to employ any engineers in civil life, at his discretion, and any other persons necessary to make such investigation, and to fix the compensation of any and all of such engineers and other persons.

Engineers.

SEC. 5. For the purpose of defraying the expenses necessary to be incurred in making the investigations herein provided for, there is hereby appropriated out of any money in the Treasury not otherwise appropriated, the sum of one million dollars, or so much thereof as may be necessary, to be disbursed by order of the President.

Appropriation for expenses.

SEC. 6. That the President is hereby requested to report to Congress the results of such investigations, together with his recommendations in the premises.

Report.

SEC. 7. That the Secretary of War shall cause the Chief of Engineers of the United States Army, in submitting his annual reports to Congress with regard to works of river and harbor improvement under his charge, to state what deterioration, if any, has taken place by destruction, decay, obstructions, or otherwise, in connection with any of such works, together with an estimate of the cost of rebuilding, or repairing such works, or removing such obstructions; and he shall also cause the said Chief of Engineers to recommend, with his reasons therefor, the discontinuance of appropriations for any river and harbor work which he may deem unworthy of further improvement.

Report of Chief of Engineers to show deterioration in works, etc.

SEC. 8. That the Secretary of War is directed to cause to be prepared and reported to Congress a list of all piers, wharves, and other structures or property pertaining to river and harbor works belonging to the Government of the United States now occupied by private corporations or persons, together with the terms upon which such piers, wharves, or other property are occupied, and the date of the agreement or permission granting the privilege to occupy the same, and shall make such recommendations as he may deem desirable in connection therewith.

Report of Government piers, etc., occupied by private corporations.

SEC. 9. That it shall not be lawful to construct or commence the construction of any bridge, dam, dike, or causeway over or in any port, roadstead, haven, harbor, canal, navigable river, or other navigable water of the United States until the consent of Congress to the building of such structures shall have been obtained and until the

Congress to authorize construction of bridges over navigable waters.—approval of plans.

may be necessary shall be expended to and
clearing a channel through the No secretary

Okanagon River, Wash.

Improving Okanagon River, be built
improvement in accordance ross rivers
Annual Report of the Chi of which lie
hundred and ninety-eight provided the

Depth of water in tidal waters defined.

The depth of water in and approved
in this Act, shall be retary of War
mean low water unl *rovided further*,

Appropriations available for repairs as well as improvement.

Appropriations r structure have
named, or so m s and by the Sec-
the discretion deviate from such
pair and res etion of the structure
cause they plans has previously been
the furthe the approval of the Chief of
ecretary of War.

Preliminary examinations, surveys, etc.

Sec. 2
where creation of any obstruction not affirm-
cies, by Congress, to the navigable capacity
serv waters of the United States is hereby pro-
of and it shall not be lawful to build or commence
p ilding of any wharf, pier, dolphin, boom, weir,
kwater, bulkhead, jetty, or other structures in any
port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or inclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same.

Provisos. Restricted t designate works.

Report tions, etc., only author-

Establishment of harbor lines.

Sec. 11. That where it is made manifest to the Secretary of War that the establishment of harbor lines is essential to the preservation and protection of harbors he may, and is hereby, authorized to cause such lines to be established, beyond which no piers, wharves, bulkheads, or other works shall be extended or deposits made, except under such regulations as may be prescribed from time to time by him: *Provided*, That whenever the Secretary of War grants to any person or persons permission to extend piers, wharves, bulkheads, or other works, or to make deposits in any tidal harbor or river of the United States beyond any harbor lines established under authority of the United States, he shall cause to be ascertained the amount of tide water displaced by any such structure or by any such deposits, and he shall, if he deem it necessary, require the parties to whom the permission is given to make compensation for such displacement either by excavating in some part of the harbor, including tide-water channels between high and low water mark, to such an extent as to create a basin for as much tide water as may be displaced by such structure or by such deposits, or in any other mode that may be satisfactory to him.

Proviso. Compensation for tide water displaced.

Penalties; removal of structures.

That every person and every corporation that
any of the provisions of sections nine, ten,
his Act, or any rule or regulation made by
War in pursuance of the provisions of the
n, shall be deemed guilty of a misde-
ction thereof shall be punished by a
nty-five hundred dollars nor less
or by imprisonment (in the case
ceeding one year, or by both
cretion of the court. And
uctures or parts of struc-
provisions of the said sec-
ne injunction of any circuit
on in any district in which such
, and proper proceedings to this end
under the direction of the Attorney-
United States.

Depositing refuse in navigable waters forbidden.

hat it shall not be lawful to throw, discharge,
osit, or cause, suffer, or procure to be thrown, dis-
rged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable water; and it shall not be lawful to deposit, or cause, suffer, or procure to be deposited material of any kind in any place on the bank of any navigable water, or on the bank of any tributary of any navigable water, where the same shall be liable to be washed into such navigable water, either by ordinary or high tides, or by storms or floods, or otherwise, whereby navigation shall or may be impeded or obstructed: *Provided*, That nothing herein contained shall extend to, apply to, or prohibit the operations in connection with the improvement of navigable waters or construction of public works, considered necessary and proper by the United States officers supervising such improvement or public work: *And provided further*, That the Secretary of War, whenever in the judgment of the Chief of Engineers anchorage and navigation will not be injured thereby, may permit the deposit of any material above mentioned in navigable waters, within limits to be defined and under conditions to be prescribed by him, provided application is made to him prior to depositing such material; and whenever any permit is so granted the conditions thereof shall be strictly complied with, and any violation thereof shall be unlawful.

Provisos.
—not applicable to public works.
—permits for depositing in defined limits.

Using, etc., wharves, levees, etc., forbidden.

SEC. 14. That it shall not be lawful for any person or persons to take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, obstruct by fastening vessels thereto or otherwise, or in any manner whatever impair the usefulness of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States, or any piece of plant, floating or otherwise, used in the construction of such work under the control of the United States, in whole or in part, for the preservation and improvement of any of its navigable waters or to prevent floods, or as boundary marks, tide gauges, surveying stations, buoys, or other established marks, nor remove for ballast or other purposes any stone or other material composing such works: *Provided*, That the Secretary of War may, on the recommendation of the Chief of Engineers, grant permission for the temporary occupation or use of any of the aforementioned public works when in his judgment such occupation or use will not be injurious to the public interest.

Proviso.
—permits for temporary use.

Obstructions by anchoring vessels.

SEC. 15. That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of the said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same, and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

—sunken vessels, timber, etc.

—duties of owner of sunken vessel.

Penalties.

SEC. 16. That every person and every corporation that shall violate, or that shall knowingly aid, abet, authorize, or instigate a violation of the provisions of sections thirteen, fourteen, and fifteen of this Act shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding twenty-five hundred dollars nor less than five hundred dollars, or by imprisonment (in the case of a natural person) for not less than thirty days nor more than one year, or by both such fine and imprisonment, in the discretion of the court, one-half of said fine to be paid to the person or persons giving information which shall lead to conviction. And any and every master, pilot, and engineer, or person or persons acting in such capacity, respectively, on board of any boat or vessel who shall knowingly engage in towing any scow, boat, or vessel loaded with any material specified in section thirteen of this Act to any point or place of deposit or discharge in any harbor or navigable water, elsewhere than within the limits defined and permitted by the Secretary of War, or who shall willfully injure or destroy any work of the United States contemplated in section fourteen of this Act, or who shall willfully obstruct the channel of any waterway in the manner contemplated in section fifteen of this Act, shall be deemed guilty of a violation of this Act, and shall upon conviction be punished as hereinbefore provided in this section, and shall also have his license revoked or suspended for a term to be fixed by the judge before whom tried and convicted. And any boat, vessel, scow, raft, or other craft used or employed in violating any of the provisions of sections thirteen, fourteen, and fifteen of this Act shall be liable for the pecuniary penalties specified in this section, and in addition thereto for the amount of the damages done by said boat, vessel, scow, raft, or other craft, which latter sum shall be placed to the credit of the appropriation for the improvement of the harbor or waterway in which the damage occurred, and said boat, vessel, scow, raft, or other craft may be proceeded against summarily by way of libel in any district court of the United States having jurisdiction thereof.

Legal proceedings, by whom conducted, etc.

Power to arrest granted certain officials.

Provisos.
—offense to be committed in presence of.
—examination of prisoner.

SEC. 17. That the Department of Justice shall conduct the legal proceedings necessary to enforce the foregoing provisions of sections nine to sixteen, inclusive, of this Act; and it shall be the duty of district attorneys of the United States to vigorously prosecute all offenders against the same whenever requested to do so by the Secretary of War or by any of the officials hereinafter designated, and it shall furthermore be the duty of said district attorneys to report to the Attorney-General of the United States the action taken by him against offenders so reported, and a transcript of such reports shall be transmitted to the Secretary of War by the Attorney-General; and for the better enforcement of the said provisions and to facilitate the detection and bringing to punishment of such offenders, the officers and agents of the United States in charge of river and harbor improvements, and the assistant engineers and inspectors employed under them by authority of the Secretary of War, and the United States collectors of customs and other revenue officers, shall have power and authority to swear out process and to arrest and take into custody, with or without process, any person or persons who may commit any of the acts or offenses prohibited by the aforesaid sections of this Act, or who may violate any of the provisions of the same: *Provided*, That no person shall be arrested without process for any offense not committed in the presence of some one of the aforesaid officials: *And provided further*, That whenever any arrest is made under the provisions of this Act, the person so arrested shall be brought forthwith before a commissioner, judge, or court of the United States for examination of the offenses alleged against him; and such commissioner, judge, or court shall proceed in respect thereto as authorized by law in case of crimes against the United States.

Obstruction to navigation by bridges.
—notice to alter.

SEC. 18. That whenever the Secretary of War shall have good reason to believe that any railroad or other bridge now constructed, or which may hereafter be constructed, over any of the navigable waterways of the United States is an unreasonable obstruction to the free navigation of such waters on account of insufficient height, width of span, or otherwise, or where there is difficulty in passing the draw opening or the draw span of such bridge by rafts, steamboats, or other water craft, it shall be the duty of the said Secretary, first giving the parties reasonable opportunity to be heard, to give notice to the persons or corporations owning or controlling such bridge so to alter the same as to render navigation through or under it reasonably free, easy, and unobstructed; and in giving such notice he shall specify the changes recommended by the Chief of Engineers that are required to be made, and shall prescribe in each case a reasonable time in which to make them. If at the end of such time the alteration has not been made, the Secretary of War shall forthwith notify the United States district attorney for the district in which such bridge is situated, to the end that the criminal proceedings hereinafter mentioned may be taken. If the persons, corporation, or association owning or controlling any railroad or other bridge shall, after receiving notice to that effect, as hereinbefore required, from the Secretary of War, and within the time prescribed by him willfully fail or refuse to remove the same or to comply with the lawful order of the Secretary of War in the premises, such persons, corporation, or association shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding five thousand dollars, and every month such persons, corporation, or association shall remain in default in respect to the removal or alteration of such bridge shall be deemed a new offense, and subject the persons, corporation, or association so offending to the penalties above prescribed: *Provided*, That in any case arising under the provisions of this section an appeal or writ of error may be taken from the district courts or from the existing circuit courts direct to the Supreme Court either by the United States or by the defendants.

—penalty.

Proviso.
—appeal.

Removal of obstructions to navigation.

SEC. 19. That whenever the navigation of any river, lake, harbor, sound, bay, canal, or other navigable waters of the United States shall be obstructed or endangered by any sunken vessel, boat, water craft, raft, or other similar obstruction, and such obstruction has existed for a longer period than thirty days, or whenever the abandonment of such obstruction can be legally established in a less space of time, the sunken vessel, boat, water craft, raft, or other obstruction shall be subject to be broken up, removed, sold, or otherwise disposed of by the Secretary of War at his discretion, without liability for any damage to the owners of the same: *Provided*, That in his discretion, the Secretary of War may cause reasonable notice of such obstruction of not less than thirty days, unless the legal abandonment of the obstruction can be established in a less time, to be given by publication, addressed "To whom it may concern," in a newspaper published nearest to the locality of the obstruction, requiring the removal thereof: *And provided also*, That the Secretary of War may, in his discretion, at or after the time of giving such notice, cause sealed proposals to be solicited by public advertisement, giving reasonable notice of not less than ten days, for the removal of such obstruction as soon as possible after the

Proviso.
—notice.

—proposals to remove.

expiration of the above specified thirty days' notice, in case it has not in the meantime been so removed, these proposals and contracts, at his discretion, to be conditioned that such vessel, boat, water craft, raft, or other obstruction, and all cargo and property contained therein, shall become the property of the contractor, and the contract shall be awarded to the bidder making the proposition most advantageous to the United States: *Provided*, That such bidder shall give satisfactory security to execute the work: *Provided further*, That any money received from the sale of any such wreck, or from any contractor for the removal of wrecks, under this paragraph shall be covered into the Treasury of the United States.

—bond of bidder.

Disposition of funds from sale of wrecks.

Vessels grounding, etc. —destruction, etc., of.

SEC. 20. That under emergency, in the case of any vessel, boat, water craft, or raft, or other similar obstruction, sinking or grounding, or being unnecessarily delayed in any Government canal or lock, or in any navigable waters mentioned in section nineteen, in such manner as to stop, seriously interfere with, or specially endanger navigation, in the opinion of the Secretary of War, or any agent of the United States to whom the Secretary may delegate proper authority, the Secretary of War or any such agent shall have the right to take immediate possession of such boat, vessel, or other water craft, or raft, so far as to remove or to destroy it and to clear immediately the canal, lock, or navigable waters aforesaid of the obstruction thereby caused, using his best judgment to prevent any unnecessary injury; and no one shall interfere with or prevent such removal or destruction: *Provided*, That the officer or agent charged with the removal or destruction of an obstruction under this section may in his discretion give notice in writing to the owners of any such obstruction requiring them to remove it: *And provided further*, That the expense of removing any such obstruction as aforesaid shall be a charge against such craft and cargo; and if the owners thereof fail or refuse to reimburse the United States for such expense within thirty days after notification, then the officer or agent aforesaid may sell the craft or cargo, or any part thereof that may not have been destroyed in removal, and the proceeds of such sale shall be covered into the Treasury of the United States.

Provisos. —notice.

—expense of removal.

—reimbursement.

Appropriation.

Such sum of money as may be necessary to execute this section and the preceding section of this Act is hereby appropriated out of any money in the Treasury not otherwise appropriated, to be paid out on the requisition of the Secretary of War.

Repeal.

That all laws or parts of laws inconsistent with the foregoing sections ten to twenty, inclusive, of this Act are hereby repealed: *Provided*, That no action begun, or right of action accrued, prior to the passage of this Act shall be affected by this repeal.

Proviso. —prior actions excepted.

Appropriation for completion of project less than estimated cost; bids.

SEC. 21. Whenever in this Act the amount provided for the completion of any project under continuing contract is less than the cost as estimated by the engineers, proposals for bids shall be invited without further action by Congress.

Preliminary examinations and surveys directed.

Scope of preliminary examination, etc.

SEC. 22. That the Secretary of War is hereby directed to cause preliminary examinations or surveys to be made at the localities named in this section as hereinafter provided. In all cases a preliminary examination shall first be made, which shall embrace information concerning the commercial importance, present and prospective, of the river or harbor mentioned, and a report as to the advisability of its improvement. Whenever such preliminary examination has been made, in case such improvement is not deemed advisable, no further action shall be taken thereon without the direction of Congress; but in case the report has been or shall be to the effect that such river or harbor is worthy of improvement, the Secretary of War is hereby directed, at his discretion, to cause surveys to be made and the cost of improving such river or harbor to be estimated and to be reported to Congress, to wit:

California.

CALIFORNIA.

Inner Harbor, San Pedro.

Napa River.

Sonoma Creek.

Suisun Creek.

Crescent Bay.

Channel between the straits of Carquinez and the Golden Gate, off Point Pinole, Point Wilson, and Lone Tree Point, with a view to obtaining a channel three hundred feet in width, of a depth of thirty feet.

Harbor of South San Francisco, San Mateo County.

Connecticut.

CONNECTICUT.

Milford Harbor.

Delaware.

DELAWARE.

Saint Jones River, Delaware, from its mouth to the highest point of feasible navigation.

Florida.

FLORIDA.

East Pass, at the entrance of Carrabelle Harbor, Florida, with a view to obtaining a channel depth of twenty-two feet at mean low water.

Ocklockonnee River.

Bay at Hudson, Pasco County.

Inside passage through Sarasota Bay to Lemon Bay.

Boca Grande and Charlotte Harbor, with a view to obtaining a depth of twenty-four feet of water over the bar at the entrance of the harbor and eighteen feet thence up to Punta Gorda.

Kissimmee River and connecting lakes and canals flowing into Lake Okechobee, thence down the Caloosahatchee River to the Gulf of Mexico, with a view to improving the navigation of the channels therein.

Punta Rassa: Inside passage to Charlotte Harbor.

Orange River: To its confluence with Caloosahatchee and thence to Gulf of Mexico.

Crystal River: From the town of Crystal River to its entrance in the Gulf of Mexico.

GEORGIA.

Georgia.

Brunswick, Georgia: Inner harbor, with a view of determining what improvement thereof is desirable in the interest of commerce and the cost thereof.

ILLINOIS.

Illinois.

Survey of Ohio River from Mound City, Illinois, to Cairo, Illinois: With a view to ascertain what improvement, if any, is desirable with a view to the protection of the banks and levees on the Illinois side.

Survey with a view to ascertain what, if anything, should be done to stop the caving of the banks of the Ohio River, at or near New Liberty, in Pope County, Illinois, and to prevent said river from cutting into a slough and chain of lakes at said point, together with the cost thereof.

Waukegan Harbor, with a view to obtaining a channel three hundred feet wide and twenty feet deep.

Survey and estimate of cost for the improvement of the channel and to prevent the cutting and caving of the bank of the Mississippi River on the Illinois side thereof, at or near Wagners Landing, in Jackson County, below Rockwood, Illinois.

Improving Chicago River, in Illinois: Survey and estimate of cost for a channel twenty-one feet deep from its mouth to the stock yards on the South Branch, and to Belmont avenue, on the North Branch, so far as may be permitted by existing docks and wharves, exclusive of cost of removing or constructing bridges or piers or lowering tunnels; and the aforesaid depth of twenty-one feet is hereby adopted as the project depth for the improvement in lieu of that fixed by the Act of June third, eighteen hundred and ninety-six: *Provided*, That all the work of removing and reconstructing bridges and piers and lowering tunnels necessary to permit a practicable channel with said depth to be obtained shall be done, or caused to be done, by the city of Chicago without expense to the United States.

Survey of the Mississippi River at or near Beach Ridge, Illinois: With a view to ascertain whether there is danger of said river breaking through into Cache River, and whether it is desirable to make further specific appropriations to protect the bank of the Mississippi River at said place; and, if so, the cost thereof.

Survey of the Mississippi River between Station Eighteen hundred and forty, as established by Government survey reported in Executive House Document Number One hundred and eleven, third session Fifty-third Congress, and the railroad embankment at the railroad bridge crossing in front of Quincy, Illinois, with a view to preventing the filling up of Quincy Bay by sediment carried by the river in times of high water.

Iowa.

IOWA.

Bellevue, Iowa: Survey with a view to ascertain whether it is desirable to construct a dam across what is known as Crooked Slough, opposite Bellevue, Iowa, on the Illinois shore of the Mississippi River, at a point in section nine, township twenty-six north, of range one east, and where the wagon road leading from Galena and Hanover, Illinois, to Bellevue, Iowa, intersects and crosses said slough.

Kentucky

KENTUCKY.

Green River, Kentucky: From Mammoth Cave, Kentucky, to Greensburg, Kentucky.

Louisiana.

LOUISIANA.

Survey of Atchafalaya Bay from the mouth of Atchafalaya River to deep water in the Gulf of Mexico, twelve feet deep at mean low water and two hundred feet wide, with an estimate of the cost of said improvement.

Maine

MAINE.

Boothbay Harbor.

Camden Harbor.

Penobscot River, at or near Bucksport Narrows.

Parkers Head Harbor and Channel, Kennebec River.

Bucksport Harbor.

Kennebec River between Gardiner Bridge and Augusta Dam, with a view to securing a channel equal in capacity to that below said bridge.

Kenduskeag River at its mouth, with a view to securing a channel two feet deep at extreme low tide for the entire width of the river.

Maryland.

MARYLAND.

Claibourne Harbor.

Queenstown Harbor.

Patuxent River, at Bristol Bar.

Brettons Bay, on the Potomac River.

Elk River.

Tyaskin Creek.

Rockhall Harbor, with a view to obtaining a channel through Swan Point Bar one hundred and fifty feet wide and twelve feet deep and a channel in the inner harbor of the same width and depth; also for a channel one hundred and ninety feet wide and twelve feet deep across the bar.

Massachusetts.

MASSACHUSETTS.

New Bedford Harbor: To remove the bar between the present channel and the northerly terminus of the proposed channel on the northerly side of the New Bedford and Fairhaven Bridge, and also of removing the bar in the channel of New Bedford Harbor about eight hundred feet southerly from Fish Island.

Vineyard Haven: With a view to its further protection and improvement as a harbor of refuge by a breakwater or otherwise.

Sandy Bay: Resurvey and estimate of cost at breakwater.

Winthrop Harbor: To provide channels of a width of seventy-five and one hundred feet, respectively, and a depth of twelve feet and fifteen feet, respectively.

Channel of Assonet River.

Piers and breakwater at Rockport.

Beverly Harbor.

Cottage City.

Westport Point Harbor.

Sandwich Harbor.

Bass River Harbor.

Cohasset Harbor, with a view to deepening the same and its channel.

Cotuit Harbor.

Harbor at Hyannis.

MICHIGAN.

Michigan.

Arcadia: To obain a channel one hundred and fifty feet wide and fourteen feet deep.

Muskegon River, from the head of Muskegon Lake to Newaygo: To obtain a depth of five feet of water.

Channel from Lake Michigan to Stoney Lake, Oceana County.

Cheboygan Harbor: To obtain a depth of eighteen feet from the entrance of said harbor to the first bridge.

Mackinac Harbor: For the protection of the harbor by breakwaters.

Copper Harbor: To obtain a depth of eighteen feet.

MINNESOTA.

Minnesota.

Vol. 28, p. 857.

Lake Superior and Mississippi River: The report upon the examination and survey for the location of a canal connecting Lake Superior and the Mississippi River, provided for by the River and Harbor Act of eighteen hundred and ninety-four, shall be supplemented by a further report as to whether such canal is feasible and an improvement which should be undertaken by the Government, and, if feasible, the probable cost of construction, operation, and maintenance of the same.

Saint Croix River, from Stillwater Harbor to Taylors Falls, Minnesota, with a view to making said river accessible to steamboats and other craft navigating said river.

Minnesota River: With a view of protecting the banks thereof at and near Saint Peter, in Nicollet County.

Two Islands or Saxton, Minnesota, situate about midway between Two Harbors and Grand Marais, Minnesota: With a view of making a harbor of refuge at that point.

Red River of the North, Minnesota and North Dakota: With a view of ascertaining what improvements, if any, should be made to govern and repress the floods of the river, and to prevent the undue erosion of the banks.

Missouri.

MISSOURI.

Current River: With a view to the improvement of said river, between the junction of Crooked Creek and Current Creek with the Current River, in the northwest corner of Shannon County and the southern line of Carter County, in the State of Missouri.

Saint Francois River: With a view to the improvement of said river, from Greenville to the mouth of Mingo.

Missouri River: With a view to prevent the erosion of the north bank thereof at and near Huntsdale, in Boone County, Missouri, with a view to prevent the erosion of the south bank thereof and the cutting of a new channel at and near the city of Napoleon, in Lafayette County, Missouri.

New Hampshire.

NEW HAMPSHIRE.

Pull-and-be-damned Point, Portsmouth Harbor: With a view to its removal, so far as the same is an obstruction to navigation.

Isles of Shoals: With a view to building a breakwater from Smutty Nose Island to Cedar Island.

New Jersey.

NEW JERSEY.

Raccoon Creek.

Woodbridge Creek.

Maurice River, Oldmans Creek.

Arthur Kill or Staten Island Sound from Kill von Kull to Raritan Bay, with a view to obtaining of a twenty-one foot channel, by way of Staten Island Sound from New York Bay to Raritan Bay.

Passaic River: With the view of ascertaining the cost and feasibility of extending a ten-foot channel of suitable width from Center-street bridge to the Montclair Railway Bridge, and also as to the feasibility and cost of affording a channel twelve feet in depth from Center-street bridge to Staten Island Sound. Also an examination of said river from Montclair Railway Bridge to the city of Paterson.

Tuckerton Creek.

New York.

NEW YORK.

Saugerties Harbor: With a view of extending the improvement from the westerly end of the south dike westerly to the "Point of Rocks;" also with a view to removing the loose rock from the channel, and continuing the depth of twelve feet, at low water, toward the head of the harbor.

Dunkirk: Survey for easterly breakwater.

Bay Shore, Long Island: With a view to constructing a breakwater.

Patchogue River.

Three Mile Harbor, Long Island.

Sag Harbor.

Tonawanda Harbor, Erie County, and Tonawanda Creek from Niagara River to the State dam.

Patchogue River: With a view to deepening the channel from Fire Island Inlet to Patchogue to a depth of eight feet, with a channel eighty feet in width.

Diamond Reef and Coenties Reef in East River, with a view to their removal.

New Rochelle Harbor.

West Chester Creek.

Tarrytown Harbor.

Port Chester Harbor.

OREGON.

Oregon.

Snake River: That portion of the Snake River extending from the town of Asotin, in the State of Washington, to Pittsburg Landing, in the State of Oregon.

Lower Willamette and Columbia rivers below Portland, Oregon: Survey and estimate of the cost of obtaining a channel depth of twenty-five feet at low water from Portland to the mouth of the Columbia River.

The canal and locks situated on the west side of the Willamette River, at Willamette Falls, in Clackamas County: With a view to ascertaining the desirability of their condemnation and purchase by the United States.

Mouth of Columbia River, Oregon and Washington: Survey and estimate with a view to obtaining a channel of forty feet depth at lowest low water, and a report as to the desirability of such improvement.

PENNSYLVANIA.

Pennsylvania.

Youghiogheny River: With a view to the improvement of said river by locks and dams from West Newton to the mouth of said river at McKeesport, Pennsylvania.

RHODE ISLAND.

Rhode Island.

Pawtucket River.

Providence harbor and river: As to the advisability of dredging that portion of the flats therein between Wilkesbarre Pier, Kettle Point, and the present ship-channel, to a depth of twenty-five feet at mean low water, to provide increased anchorage grounds, and a project for such improvement, with the probable cost thereof.

SOUTH CAROLINA.

South Carolina.

Sampit River: From its mouth at the twenty-foot depth at low water in Winyah Bay to its head of navigation, with the view of dredging shoals and removing other obstructions.

Wee Tee Lake, Williamsburg County: From its junction with the Santee River to a point called the Bluff, with a view to make it navigable for steamboats.

Lynch's River: From the railroad bridge at Effingham to its mouth at junction of Great Pee Dee River, with a view to procuring a depth of three feet at mean low water.

The waterways and low-lying marsh lands or rice lands between the North and South Santee rivers, with a view to extending the Estherville Minim Creek Canal in a southerly direction to Alligator River.

The waterways between Charleston Harbor and Alligator Creek, with a view to ascertaining the present cost of the improvement thereof.

Tennessee.

TENNESSEE.

Little Tennessee River: For its survey from its mouth to the slate quarries on Abram's Creek.

Holston River: For its survey from its mouth to Kingsport.

Richland River: From its mouth to Dayton.

Powell's River: For its survey from its mouth to Kyle's Ford.

Hiawassee River: For its survey from its mouth to the mouth of the Ocoee River.

Texas.

TEXAS.

Harbor at Alligator Head, in Matagorda Bay, and the harbor at Brazos Santiago, off Point Isabel, Texas, with plans and estimates for the removal of the bars at said harbors to furnish an inlet to each of said harbors to permit ocean-going vessels to enter said harbors with necessary depths of channel.

Clear Creek.

Dickinson Bayou.

Highland Bayou.

Turtle Bayou.

Oyster Creek.

Chocolate Bayou.

Bostrop Bayou.

East Bay Bayou.

Colorado River.

San Bernard River.

Caney Creek.

For a canal ten feet deep and one hundred feet wide around the raft in the Colorado River, in Matagorda County.

Red River, from the mouth of the Kiamitia River to the mouth of Blue River.

Virginia.

VIRGINIA.

Channel at Middle Ground Bar, in the harbor of Hampton Roads, with a view to determining what amount of dredging is necessary over said bar to secure a channel five hundred feet wide and thirty feet deep at mean low tide.

To dredge channel leading to Tangier Island, in Tangier Sound, and ascertain most feasible channel for improvement.

To remove bar at the mouth of Jackson's Creek, in Middlesex County.

James River: With a view of ascertaining what expenditure will be necessary to continue improvement to the head of navigation at the Docks.

To improve mouth or entrance to Carters Creek, Lancaster County.

Washington.

WASHINGTON.

Neah Bay: With a view to its improvement as a harbor of refuge.

WEST VIRGINIA.

West Virginia.

Elk River from its mouth to Sutton.

Guyandotte River from its mouth to a point fifty miles above.

WISCONSIN.

Wisconsin.

East shore of Lake Pepin, in the Mississippi River, near the village of Pepin, with a view to the construction of a pier, or a harbor of refuge.

Harbor at Port Washington: With a view of obtaining a channel fifteen feet in depth, and of extending piers three hundred feet and of protecting the same by breakwater, or otherwise.

Harbor at Kewaunee: With a view of making a harbor of refuge with a depth of not less than twenty feet.

Menominee River, Michigan and Wisconsin: From the line of the second, or dredging, project, reported under date of November thirtieth, eighteen hundred and ninety-six, by Captain George A. Zinn, up the river to the west line of Wells street, with a view to obtain a channel eighteen feet in depth.

Harbor at Green Bay: With a view to obtain a channel twenty feet in depth from the mouth of Fox River up to the city of Green Bay.

Harbor at Manitowoc: With a view to protecting the harbor from the injurious effect of northeast seas, by extending the breakwater in said harbor in an easterly direction and on a line with the north pier, four hundred feet, or otherwise.

Harbor at Two Rivers: With a view to secure better means of access to said harbor, and to secure a sufficient depth of water therein, by extending the piers four hundred feet, or otherwise.

Harbor at Port Wing.

Harbor at Kenosha: With a view of enlarging the basin.

Harbor at Oconto: With a view of securing better access thereto and a sufficient depth of water therein, by extending the piers three hundred feet, or otherwise.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 427.—An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and ninety-nine, and for prior years, and for other purposes.

Deficiencies appropriations.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated, out of any money in the Treasury not otherwise appropriated, to supply deficiencies in the appropriations for the fiscal year eighteen hundred and ninety-nine, and for prior years, and for other objects hereinafter stated, namely:

* * * * *

Maj. Charles F. Powell, Capt. C. S. Richie.

Credit in accounts of.

CREDIT IN ACCOUNTS OF CERTAIN OFFICERS, CORPS OF ENGINEERS: Authority is hereby granted to the proper accounting officers of the Treasury to allow and credit in the accounts of certain officers of the Corps of Engineers of the United States Army amounts standing against them on the books of the Treasury, as follows: Major Charles F. Powell, ninety-seven dollars and eighty-seven cents; Captain C. S. Riche, twelve dollars and eighty-one cents; in all, one hundred and ten dollars and sixty-eight cents.

* * * * *

Miscellaneous. Engineer Department, Army.

MISCELLANEOUS, WAR DEPARTMENT.

Deficiency appropriation for employees of staff officers of division, etc., commanders available for, on staff department commanders.
Laws, 2d sess. 55th Cong., p. 704.

The appropriation made in the deficiency appropriation Act, approved January fifth, eighteen hundred and ninety-nine, for services of surveyors, draftsmen, photographers, and clerks to engineer officers on the staff of division and corps commanders is hereby made available also for civilian employees to engineer officers on the staff of department commanders.

* * * * *

Sergt. Charles Floyd. Monument to.

MONUMENT TO SERGEANT CHARLES FLOYD: To enable the Secretary of War, in cooperation with the Floyd Memorial Association, to cause to be erected over the remains of Sergeant Charles Floyd, a member of the Lewis and Clark expedition, who died and was buried August twentieth, eighteen hundred and four, near the present site of Sioux City, Iowa, a fitting monument commemorative of that expedition and of the first soldier to lay down his life within the Louisiana purchase, five thousand dollars: *Provided*, That the total cost and expense to the United States of erecting said monument shall not exceed five thousand dollars.

Proviso. Limit of cost.

* * * * *

Yellowstone River, Mont.

YELLOWSTONE RIVER, MONTANA: To pay amounts found due by the accounting officers of the Treasury on account of the appropriation "Improving Yellowstone River, Montana," fifteen dollars and seventy-nine cents.

* * * * *

Claims allowed by the Auditor for the War Department.

CLAIMS ALLOWED BY THE AUDITOR FOR THE WAR DEPARTMENT.

* * * * *

East River, etc., N. Y.

For removing obstructions from East River and Hell Gate, New York, sixteen dollars.

* * * * *

Approved, March 3, 1899.

March 3, 1899.

CHAP. 428.—An Act Making appropriations for fortifications and other works of defense, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes.

Fortifications appropriations.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the sums of money herein provided for be, and the same are hereby, appropriated, out of any moneys in the Treasury not otherwise appropriated, to be available until expended, namely:

Fortifications.

FORTIFICATIONS AND OTHER WORKS OF DEFENSE.

Gun and mortar batteries.

For construction of gun and mortar batteries, one million dollars.

Transfer to War Department of Admiralty Head light-house reservation, Washington.

—portion of military reservation to be exchanged.

Removal of light-house.

—reestablishment on new site.

That the Secretary of the Treasury is hereby authorized and directed to transfer to the War Department, for purposes of the public defense, the present light-house reservation at Admiralty Head, on Admiralty Inlet, in the State of Washington, in exchange for a suitable and sufficient portion of the military reservation at that point, to be mutually agreed upon between the said Secretary of the Treasury and the Secretary of War, which said portion of the military reservation, together with the necessary right of way to permit of access to the same, the Secretary of War is hereby authorized and directed to transfer to the Treasury Department for light house purposes; and the Secretary of War is further authorized and directed to remove the light-house and other buildings and structures pertaining to the light-house station from their present location and to reerect and establish them complete and ready for service on the new site to be selected therefor as herein provided, or to erect new buildings and structures in lieu of those which can not be so moved, as may be found necessary in accordance with plans and details to be mutually agreed upon by the Secretary of the Treasury and the Secretary of War, the cost thereof, not exceeding eight thousand dollars, to be defrayed from funds appropriated for gun and mortar batteries.

Sites.

For the procurement of land, or right pertaining thereto, needed for the site, location, construction, or prosecution of works, for fortifications and coast defenses, three hundred thousand dollars.

Repairs.

For the protection, preservation, and repair of fortifications for which there may be no special appropriation available, one hundred thousand dollars.

Plans.

For preparation of plans for fortifications, five thousand dollars.

Sea walls, etc.

For construction of sea walls and embankments, two thousand five hundred dollars.

Mines, etc.

For the purchase of submarine mines and necessary appliances to operate them for closing the channels leading to our principal seaports, needful casemates, cable galleries, and so forth, to render it possible to operate submarine mines, and continuing torpedo experiments, fifty thousand dollars.

* * * * *

Purchases to be of American manufacture.

—exception.

That all material purchased under the foregoing provisions of this Act shall be of American manufacture, except in cases when, in the judgment of the Secretary of War, it is to the manifest interest of the United States to make purchases in limited quantities abroad, which material shall be admitted free of duty.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 433.—An Act To confirm title to lots thirteen and fourteen, in square nine hundred and fifty-nine, in Washington, District of Columbia.

District of Columbia.
Quitclaim to Thomas Yates of certain lots.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and he is hereby, authorized and directed to release and quitclaim to Thomas Yates, his heirs and assigns forever, all the right, title, and interest, whether legal or equitable, of the United States of America in and to all those lots or parcels of ground situated in the city of Washington, District of Columbia, and known on the ground plan of said city as lots numbered thirteen and fourteen, in square nine hundred and fifty-nine, upon the payment by the said Thomas Yates of such a sum as the said Secretary of the Interior shall deem just and equitable: *Provided*, That the said Thomas Yates pay to the proper officer of the District of Columbia all taxes heretofore assessed against said property, both general and special now unpaid and standing against said property.

Proviso.
Payment of taxes.

—correction of records of War Department, etc.

SEC. 2. That the Secretary of War be, and he is hereby, authorized and directed to correct the records of the War Department in respect of any of the lots mentioned in Senate Document Numbered Two hundred and seventy-seven, Fifty-fifth Congress, second session (being a letter from the Secretary of War transmitting, in compliance with the resolution of the Senate of January twenty-seventh, eighteen hundred and ninety-eight, a letter from the Chief of Engineers, together with list of lots in the city of Washington, District of Columbia, the title to which the records of his office show to be in the United States, and list of lots in the city of Washington, District of Columbia, which are shown by the records of his office to have been donated by the United States), upon the filing by an actual occupant of any of the lots mentioned in said document sufficient proof that the said occupant or the party under whom he claims has been in actual possession of the said lot or lots for an uninterrupted period of twenty years, so that said records shall show the title to said lots to be in the said occupant.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 436.—An Act To amend an Act entitled "An Act to suspend the operation of certain provisions of law relating to the War Department, and for other purposes."

Army.
Suspension of certain provisions of law.
Laws, 2d sess. 55th Cong., p. 433.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That an Act entitled "An Act to suspend the operation of certain provisions of law relating to the War Department, and for other purposes," approved June seventh, eighteen hundred and ninety-eight, is hereby amended so as to read as follows:

"That the operation of the following provisions of law be, and is hereby, continued suspended for such further time as, in the discretion of the Secretary of War, may be found necessary, or until otherwise provided by Congress, not longer, however, than March first, nineteen hundred, namely:

* * * * *

Admission free of war materials.

SEC. 2. That during the time the operation of the foregoing provisions of law shall remain so suspended pursuant to this Act materials required by the War Department may, in the discretion of the Secretary of War, be purchased abroad, and shall be admitted free of duty.

* * * * *

Approved, March 3, 1899.

March 3, 1899.

CHAP. 437.—An Act Granting to the Muscle Shoals Power Company right to erect and construct canal and power stations at Muscle Shoals, Alabama.

Muscle Shoals Power Company may construct canal, etc., at Muscle Shoals, Ala.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Muscle Shoals Power Company, a corporation created and organized under a charter granted by the legislature of the State of Alabama, its successors or assigns, to erect, construct, operate, and maintain inlet and outlet races or canals and a power station or stations at a point or points at or near the Muscle Shoals in Tennessee River, and to make such other improvements as may be necessary within said limits for the development of water power and transmission of the same: *Provided,* That the constructions hereby authorized do not in any way interfere with the Muscle Shoals Canal, or with navigation of said river: *Provided further,* That until the plans and location of the works herein authorized, so far as they affect the interests of navigation, have been approved by the Secretary of War, the improvements shall not be commenced or built, and the Secretary of War is authorized and directed to fix reasonable charges for use of said power.

Provisos.
No interference with Muscle Shoals Canal, etc.
Approval of Secretary of War.

Commencement and completion.

SEC. 2. That unless the work herein authorized be commenced within one year and completed within three years from the date hereof, the privileges hereby granted shall cease and be determined.

Amendment.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 448.—An Act To authorize the construction of a bridge across the Missouri River at the city of Yankton, South Dakota.

Dakota Southern Railroad may bridge Missouri River at Yankton.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be lawful for the Dakota Southern Railroad Company, a corporation organized for that purpose under the general corporation laws of the State of South Dakota, or its assigns, to construct, under and subject to the conditions and limitations hereafter provided, a combined railroad, wagon, and foot-passenger bridge across the Missouri River, at the city of Yankton, South Dakota, and to lay on and over said bridge railway tracks for the more perfect connection of any and all railways that now are, or which may hereafter be, constructed to the Missouri River at the city of Yankton, or to the river on the opposite side of the same, near the city of Yankton, and to build, erect, and lay on and over said bridge ways for wagon, vehicles of all kinds, and for the transit of animals, and to provide ways for foot passengers, and to maintain and operate said bridge for the purposes aforesaid; and that when said bridge is constructed all trains of railroads terminating at said river, and on the opposite side thereof, at the city of Yankton, South Dakota, shall be allowed to cross said bridge for reasonable compensation to be made to the owners of the same; and if the amount of said compensation can not be agreed upon by the parties the same shall be fixed by the Secretary of War. The owners of said bridge may also charge and receive reasonable compensation or tolls for the transit over said bridge of all wagons, carriages, vehicles, animals, and foot passengers: *Provided*, That the Secretary of War may at any time prescribe such rates of toll for such transit over said bridge as may be deemed proper and reasonable.

Transit, etc.

Tolls.

Proviso.
—rates.

May be drawbridge, etc.

SEC. 2. That any bridge built under the provisions of this Act may, at the option of the corporation building the same, be built as a drawbridge, or with unbroken or continuous spans: *Provided*, That if the same shall be made of unbroken continuous spans, it shall not be in any case of less elevation than fifty feet above extreme high-water mark, as understood at the point of location, to the lowest part of the superstructure; nor shall the spans of said bridge be less than three hundred feet in the clear at low-water mark; and the piers of said bridge shall be parallel with the current of the river at high water, and the main spans shall be over the main channels of the river: *And provided also*, That if a bridge shall be built under this Act as a drawbridge the same shall be constructed as a pivot drawbridge, with one or more draws, as the Secretary of War may prescribe, and with spans of not less than two hundred feet in length in the clear on each side of the central or pivot piers of the draws, and the next adjoining spans over the river to the draws shall not be less than two hundred and fifty feet in the clear, measured at low water; and said spans shall not be less than ten feet above extreme high-water mark, measuring to the lowest part of the superstructure of the bridge; and the piers of said bridge shall be parallel with the current of the river at high water: *And provided also*, That said draw shall be opened promptly, upon reasonable signal, without unnecessary delay; and said company or corporation shall maintain, at its own expense, from sunset till sunrise, such lights or other signals on said bridge as the Light-House Board shall prescribe, and such sheer booms or other structures as may be necessary to safely guide vessels, rafts, or other water craft safely through said channel span, or draw openings, and as shall be designated and required by the Secretary of

Provisos.
Construction if built of unbroken spans.

—if as drawbridge.

Draw.

Lights.

Permanent channel, etc.
Position of bridge.
Proximity to other bridges.

War: *And provided further*, That the corporation building said bridge may, subject to the approval of the Secretary of War, enter upon the banks of said river, either above or below the point of location of said bridge, and confine the flow of the water to a permanent channel, and to do whatever may be necessary to accomplish said object, but shall not impede or obstruct the navigation of said river, and shall be liable in damages for all injuries to private property; and all plans for such works or erections upon the banks of the river shall first be submitted to the Secretary of War for his approval: *And provided further*, That any bridge built under the provisions of this Act shall be at right angles to the current of the river at high water: *And provided further*, That the bridge herein authorized to be constructed shall not be built within less than one mile of any other bridge across said Missouri River.

Secretary of War to approve plans, etc.
Changes.
Litigation.
Removal of piling, etc.

SEC. 3. That no bridge shall be erected or maintained under the authority of this Act which shall at any time substantially or materially obstruct the free navigation of said river; and no bridge shall be commenced or built under this Act until the location thereof and the plans and specifications for its construction shall have been submitted to and approved by the Secretary of War; and any change in the plan of its construction or any alteration in the bridge after its construction shall be subject to the like approval; and whenever said bridge or its accessory works shall, in the opinion of the Secretary of War, unreasonably obstruct the free navigation of said river, he is hereby authorized to cause such change or alteration of said bridge or its accessory works to be made as will effectually obviate such obstruction; and all such alterations shall be made and all such obstructions be removed at the expense of the owner or owners of said bridge, or the persons operating or controlling the same; and in case of any litigation arising from any obstruction or alleged obstruction to the free navigation of the Missouri River, at or near the crossing of said bridge, caused or alleged to be caused thereby, the cause shall be commenced and tried in the circuit courts of the United States of either judicial district of South Dakota or Nebraska in which the said bridge or any portion of such obstruction touches. And the bridge shall not be open to traffic until all piling and other false work used in constructing the bridge shall have been wholly removed to the satisfaction of the Secretary of War.

To be lawful structure, etc.
Telegraph etc., lines.

SEC. 4. That any bridge built under this Act and according to its limitations shall be a lawful structure, and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transportation over the same of the mails, the troops, and munitions of war of the United States than the rate per mile paid for their transportation over the railroad or public highways leading to such bridge. The United States shall also have the right to construct, without charge therefor, telegraph or telephone lines across said bridge.

Amendment.

SEC. 5. That Congress may at any time alter, amend, or repeal this Act.

Commencement and completion.

SEC. 6. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within one year, and completed within three years from the date hereof.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 451.—An Act To authorize the construction of a bridge over the Tennessee River at or near Sheffield.

Tennessee Bridge and Ferry Company may bridge Tennessee River at Sheffield, Ala.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be lawful for the Tennessee Bridge and Ferry Company, of Alabama, a corporation duly and legally incorporated under the laws of the State of Alabama, its successors or assigns, to construct and maintain a bridge over the Tennessee River at or near Sheffield, in Colbert County, Alabama. Said bridge shall be constructed to provide for the passage of railway trains, and, at the option of the persons by whom it may be built, may be used for the passage of wagons and vehicles of all kinds, for the transit of animals, and for foot passengers, for such reasonable rates of toll as may be approved from time to time by the Secretary of War.

Toll.

To be lawful structure.

Post route.

SEC. 2. That any bridge built under the provisions of this Act and subject to its limitations shall be a lawful structure, and shall be recognized and known as a post route, upon which also no higher charge shall be made for the transmission over the same of the mails and troops and the munitions of war of the United States, or passengers or freight passing over the said bridge, than the rate per mile paid for the transportation over the railroad or public highways leading to the said bridge; and it shall enjoy the rights and privileges of other post roads in the United States; and the United States shall have the right of way across said bridge and its approaches for postal-telegraph purposes, and all telegraph and telephone companies shall have equal rights and privileges in constructing and maintaining their lines across said bridge.

Draw, etc.

SEC. 3. That said bridge shall be constructed as a drawbridge of such character of construction, and having such width of draw openings and such elevation above high water, as the Secretary of War may prescribe; and the draw openings of said bridge shall be so protected and arranged that water crafts can be worked through them at any and all times; and the piers of said bridge shall be parallel with and the bridge itself at right angles to the current of the river: *Provided*, That said draw shall be opened promptly upon reasonable signals for the passage of boats; and said company or corporation shall maintain at its own expense, from sunset until sunrise, such lights or other signals on said bridge as the Light-House Board shall prescribe. No bridge shall be erected or maintained under authority of this Act which at any time substantially or materially obstructs the free navigation of said river; and if any bridge erected under such authority shall, in the opinion of the Secretary of War,

Provisos.

Lights, etc.

Obstruction to navigation.

Changes, etc.

obstruct such navigation, he is hereby authorized to cause such change or alteration of said bridge to be made as will effectually obviate such obstruction; and all such alterations shall be made and all such obstructions be removed at the expense of the owner or owners of said bridge, and in case of any litigation arising from any obstruction or alleged obstruction to the free navigation of said river, caused or alleged to be caused by said bridge, the cause may be brought in the circuit court of the United States or the State of Alabama in whose jurisdiction any portion of said obstruction or bridge may be located: *Provided further*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or exempt this bridge from the operation of the same.

Litigation.

Rights of railroads to use.

SEC. 4. That all railroad companies desiring the use of said bridge shall have and be entitled to equal rights and privileges relative to the passage of railway trains over the same, and over approaches thereto, upon payment of a reasonable compensation for such use; and in case the owner or owners of said bridge and the several railroad companies, or any of them, desiring such use shall fail to agree upon the sum or sums to be paid and upon rules and conditions to which each shall conform in using said bridge, all matters at issue between them shall be decided by the Secretary of War, upon a hearing of the allegations and proofs of the parties.

—disagreement with owner of bridge.

Secretary of War to approve plans, etc.

SEC. 5. That any bridge authorized to be constructed under this Act shall be built and located under and subject to such regulations for the security of navigation of said river as the Secretary of War shall prescribe; and to secure that object the said company shall submit to the Secretary of War for his examination and approval a design and drawing of the bridge and a map of location, giving, for the space of one mile above and one mile below the proposed location, the topography of the banks of the river, the shore lines at high and low water, the directions and strength of currents at all stages, and soundings accurately showing the bed of the stream, and the location of any other bridge or bridges, and shall furnish such other information as may be required for a full and satisfactory understanding of the subject; and until the said plan and location of the bridge are approved by the Secretary of War the bridge shall not be built; and if any change is required by the Secretary of War in the plan of said bridge while the same is in progress of construction or after its completion, or if the entire removal of said bridge is required by him at any time, the cost of such change or removal shall be paid by the company owning or controlling said bridge.

Amendment.

SEC. 6. That the right to alter or amend or repeal this Act is hereby expressly reserved.

Commencement and completion.

SEC. 7. That this Act shall be null and void if actual construction of the bridge herein authorized be not commenced within one year and completed within three years from the date hereof.

Approved, March 3, 1899.

March 3, 1899.

CHAP. 458.—An Act Relative to the control of wharf property and certain public spaces in the District of Columbia.

District of Columbia. Commissioners to have control of wharf property.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, with the exceptions hereinafter provided, the Commissioners of the District of Columbia shall have the exclusive charge and control of all wharf property belonging to the United States or to the District of Columbia within said District, including all the wharves, piers, bulkheads, and structures thereon and waters adjacent thereto within the pier lines, and all slips, basins, docks, water fronts, land under water, and structures thereon, and the appurtenances, easements, uses, reversions, and rights belonging thereto, which are now owned or possessed by the United States or the District of Columbia, or to which they or either of them is or may become entitled, or which they or either of them may acquire under the provisions hereof or otherwise; and said Commissioners of the District of Columbia shall have exclusive charge and control of the repairing, building, rebuilding, maintaining, altering, strengthening, leasing, and protecting said property and every part thereof, and all the cleaning, dredging, and deepening necessary in and about the same within the pier lines. Said Commissioners are also hereby authorized and empowered to make all needful rules and regulations for the government and control of all wharves, piers, bulkheads, and structures thereon, and waters adjacent thereto within the pier lines, and all the basins, slips, and docks, with the land under water, in said District not owned by the United States or the District of Columbia: *Provided*, The the following described property shall be placed under the immediate jurisdiction and control of the Chief of Engineers of the United States: The banks of the Potomac River from the north line of the Arsenal Grounds to the southern curb line of N street south; also five hundred linear feet of shore line in the Flushing Reservoir at the foot of Seventeenth street, west, and west from the western curb of said street, including a levee one hundred feet wide.

Regulations.

Proviso. Property controlled by Chief of Engineers.

Regulations.

SEC. 2. That said Commissioners and the Chief of Engineers of the United States Army are hereby authorized and empowered to make all needful rules and regulations for the government and proper care of all the property placed in their charge and under their respective control by the provisions of section one of this Act and to annex such reasonable penalties to said rules and regulations as will secure their enforcement; and also to make and enforce rules and regulations in regard to building and repairing wharves, the rental thereof, and the rate of wharfage. All rents so collected shall be covered into the Treasury of the United States, one-half to be placed to the credit of the United States and one half to the credit of the District of Columbia. No lease made under the provisions of this Act shall extend beyond the period of ten years.

Leases.

Testing grounds in Potomac Park for Department of Agriculture.

That the Secretary of War is authorized to grant permission to the Department of Agriculture for the temporary occupation of such area or areas of Potomac Park, not exceeding a total of seventy-five acres in extent, as may not be needed in any one season for the reclamation or park improvement, the said areas to be used by the Department of Agriculture as testing grounds: *Provided*, That nothing herein contained shall be construed to change the essential character of the lands so used, which lands shall continue to be a public park, as provided in the Act of Congress approved March third, eighteen hundred and ninety-seven: *And provided further*, That said area or areas shall be vacated by the Department of Agriculture at the close of any season upon the request of the Secretary of War: *And provided further*, That the entire park shall remain under the charge of the Secretary of War.

Proviso. Character of land not to be changed, etc. Vol. 29, p. 624.

Park to be under control of Secretary of War.

That on or before January first, nineteen hundred and three, the fence around the Botanical Garden shall be removed: *Provided*, That at the first session of the Fifty-sixth Congress the Joint Committee on Library is directed to report a bill embodying a plan for removing the Botanical Garden to another location.

Removal of Botanical Garden fence.

Proviso. —of Botanical Garden.

SEC. 3. That the harbor lines of the District of Columbia shall be determined by the Chief of Engineers, United States Army, and the Commissioners of the District of Columbia, subject to the approval of the Secretary of War.

Harbor lines.

Approved, March 3, 1899.

RESOLUTIONS.

[No. 2.] Joint Resolution For the improvement of the harbor at Racine, Wisconsin.

January 10, 1899.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, requested and directed to cause a survey to be made of the harbor at Racine, Wisconsin, to ascertain the best method or plan, by breakwaters or otherwise, to prevent the injurious effects of the northeast seas, and to report said method or plan with the approximate cost of the same, and that the Secretary of War report as to the advisability of making such improvement.

Racine, Wis. Investigation and report on harbor improvement.

Approved, January 10, 1899.

[No. 3.] Joint Resolution For improvement of the harbor at Kenosha, Wisconsin.

January 10, 1899.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, requested and directed to cause a survey to be made of the harbor at Kenosha, Wisconsin, to ascertain the best method or plan, by breakwaters or otherwise, to prevent the injurious effects of the northeast seas, and to report said method or plan, with the approximate cost of the same, and that the Secretary of War report as to the advisability of making such proposed improvement.

Kenosha, Wis. Investigation and report on harbor improvement.

Approved, January 10, 1899.

January 10, 1899.

[No. 4.] Joint Resolution Asking for preliminary survey of Ohio River at or near Cincinnati.

Ohio River.
Survey of, at Cullums Riffle, below Cincinnati, for dam, etc.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and directed to cause a preliminary survey to be made of the Ohio River at a point at or near Cullums Riffle, immediately below the city of Cincinnati, Ohio, for the purpose of reporting upon the probable cost and advisability of constructing a suitable lock and dam across said river at that point, of sufficient dimensions to secure a channel depth opposite said city of not less than six feet of water at low-water stage.

The expense of this investigation and report shall be paid for out of any moneys remaining unexpended in any funds heretofore appropriated for the improvement of the Ohio River.

Approved, January 10, 1899.

January 12, 1899.

[No. 5.] Joint Resolution Providing for estimate of cost of certain improvements of Bridgeport Harbor, Connecticut.

Bridgeport, Conn.
Estimates for harbor improvement, etc.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and directed to submit estimates of the cost of extending the channel of Bridgeport Harbor, Connecticut, through an arm of the sea known as Yellow Mill Branch of said harbor, such channel to be twelve feet deep and two hundred feet wide; also of widening the main channel to the western harbor line, between the inner beacon and the Naugatuck Railroad wharf, with a depth of twelve feet; all as shown by maps and surveys made in compliance with the provisions of the river and harbor Act of August seventeenth, eighteen hundred and ninety-four, and submitted to Congress under date of November twenty-ninth, eighteen hundred and ninety-five.

Vol. 28, p. 339.

Approved, January 12, 1899.

January 12, 1899.

[No. 7.] Joint Resolution Directing the Secretary of War to submit a report of survey and estimate for the improvement of the east channel in New York Harbor.

New York Harbor.
Improvement of east channel, etc.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, directed to submit a report of survey and estimate for the improvement of the east channel in New York Harbor, from The Narrows to the sea, and for the enlarging of the same to the depth of thirty-five feet and a width of one thousand five hundred feet, and to also report upon the desirability of such improvement.

Approved, January 12, 1899.

[No. 9.] Joint Resolution For the improvement of Mystic River, Massachusetts.

January 21, 1899.

Mystic River, Mass.
Estimates for improvement of.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and directed to prepare and submit plans and estimates for the improvement of Mystic River, Massachusetts, with a view of obtaining a depth of twenty-five feet and three hundred feet width to a point about three thousand five hundred feet above Chelsea Bridge, so called, between Boston and Chelsea.

Approved, January 21, 1899.

PRIVATE ACT.

CHAP. 529.—An Act Directing the issue of a check in lieu of a lost check drawn by H. C. Newcomer, captain of engineers, in favor of Stone and Stansell.

March 3, 1899.

Preamble.

Whereas it appears that H. C. Newcomer, captain of engineers at Memphis, Tennessee, on December fifth, eighteen hundred and ninety-eight, did issue a check, numbered three hundred and eighty-one thousand seven hundred and forty-one, upon the assistant treasurer of the United States at New York, to the order of Stone and Stansell, for the sum of three thousand eight hundred and eleven dollars and two cents, being in part payment under a contract for levee construction and retained percentage, Lower Yazoo District, improving Mississippi River; and

Whereas said check was subsequently lost in transmission through the mails to New York, and the amount thereof has never been received by said Stone and Stansell or their assigns; and

Vol. 23, p. 306.
R. S., sec. 3646, p. 717.

Whereas the provisions of the Act of February sixteenth, eighteen hundred and eighty-five, amending section thirty-six hundred and forty-six, Revised Statutes of the United States, authorizing United States disbursing officers and agents to issue duplicates of lost checks, apply only to checks drawn for two thousand five hundred dollars or less: Therefore,

H. C. Newcomer to issue duplicate of lost check.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That said H. C. Newcomer, captain of engineers, be, and is hereby, instructed to issue a duplicate of said original check to Stone and Stansell, under such regulations in regard to its issue and payment as have been prescribed by the Secretary of the Treasury for the issue of duplicate checks under the provisions of section thirty-six hundred and forty-six, Revised Statutes of the United States.

Approved, March 3, 1899.

CONCURRENT RESOLUTIONS.

DEEP CREEK, VIRGINIA.

December 21, 1898.

Deep Creek, Virginia.

Estimate for improvement of.

Resolved by the House of Representatives (the Senate concurring), That the Secretary of War be, and he is hereby, directed to prepare and submit an estimate of the cost of widening and deepening Deep Creek, Virginia, from the South Branch of the Elizabeth River to the new lock at the Dismal Swamp Canal.

Passed by the House of Representatives, December 20, 1898.

Passed by the Senate, December 21, 1898.

CAPE PORPOISE, MAINE.

December 21, 1898.

Cape Porpoise, Maine.

Estimate for improvement of.

Resolved by the House of Representatives (the Senate concurring), That the Secretary of War be directed to submit an estimate of the probable cost of improving the harbor of Cape Porpoise, Maine, in accordance with the recommendations contained in the report of Colonel P. C. Hains, dated October twenty-sixth, eighteen hundred and ninety-four, now on file at the War Department.

Passed by the House of Representatives, December 20, 1898.

Passed by the Senate, December 21, 1898.

CLEVELAND, OHIO.

December 21, 1898.

Cleveland, Ohio.

Estimates for harbor improvement.

Resolved by the House of Representatives (the Senate concurring), That the Secretary of War be, and he is hereby, authorized and directed to prepare and submit estimates of the cost of dredging Cleveland Harbor in accordance with the recommendations of Colonel Jared A. Smith, local engineer, in his report for the year eighteen hundred and ninety-eight.

Passed by the House of Representatives, December 20, 1898.

Passed by the Senate, December 21, 1898.

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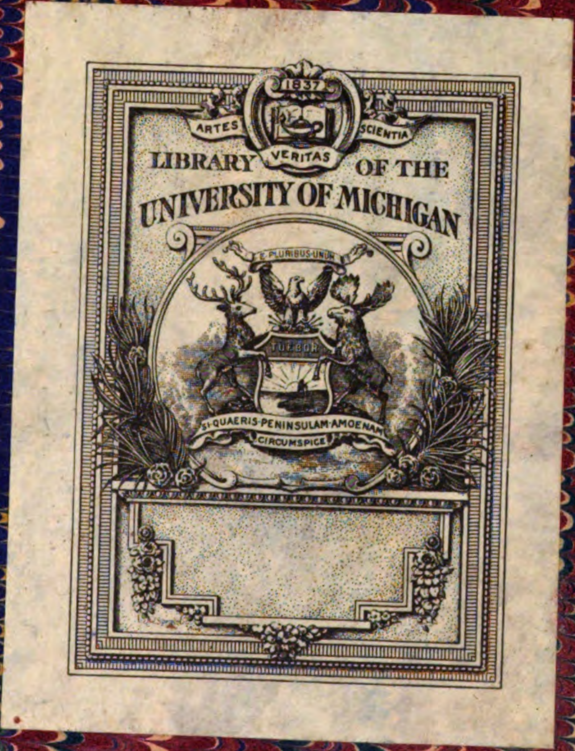

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